



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

TX 580.3 .S741

Spear, Mary A.

Leaves and flowers, or, Plant studies fo

701

Stanford University Libraries



3 6105 04929 9055

LEAVES
are
FLOWERS
SPEAR



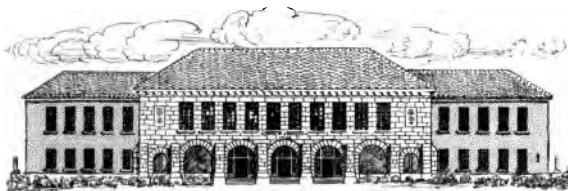
DEPARTMENT OF EDUCATION
ISLAND STANFORD JUNIOR UNIVERSITY

PRESENTED BY THE PUBLISHERS

—TO THE—

TEXT-BOOK COLLECTION

—OF THE—



SCHOOL OF EDUCATION
LIBRARY

TEXTBOOK COLLECTION
GIFT OF
THE PUBLISHERS

STANFORD UNIVERSITY
LIBRARIES



2011-12-20 17:17:17

PRESENTED BY THE PUBLISHERS
— TO THE —
TEXT-BOOK COLLECTION

OF THE

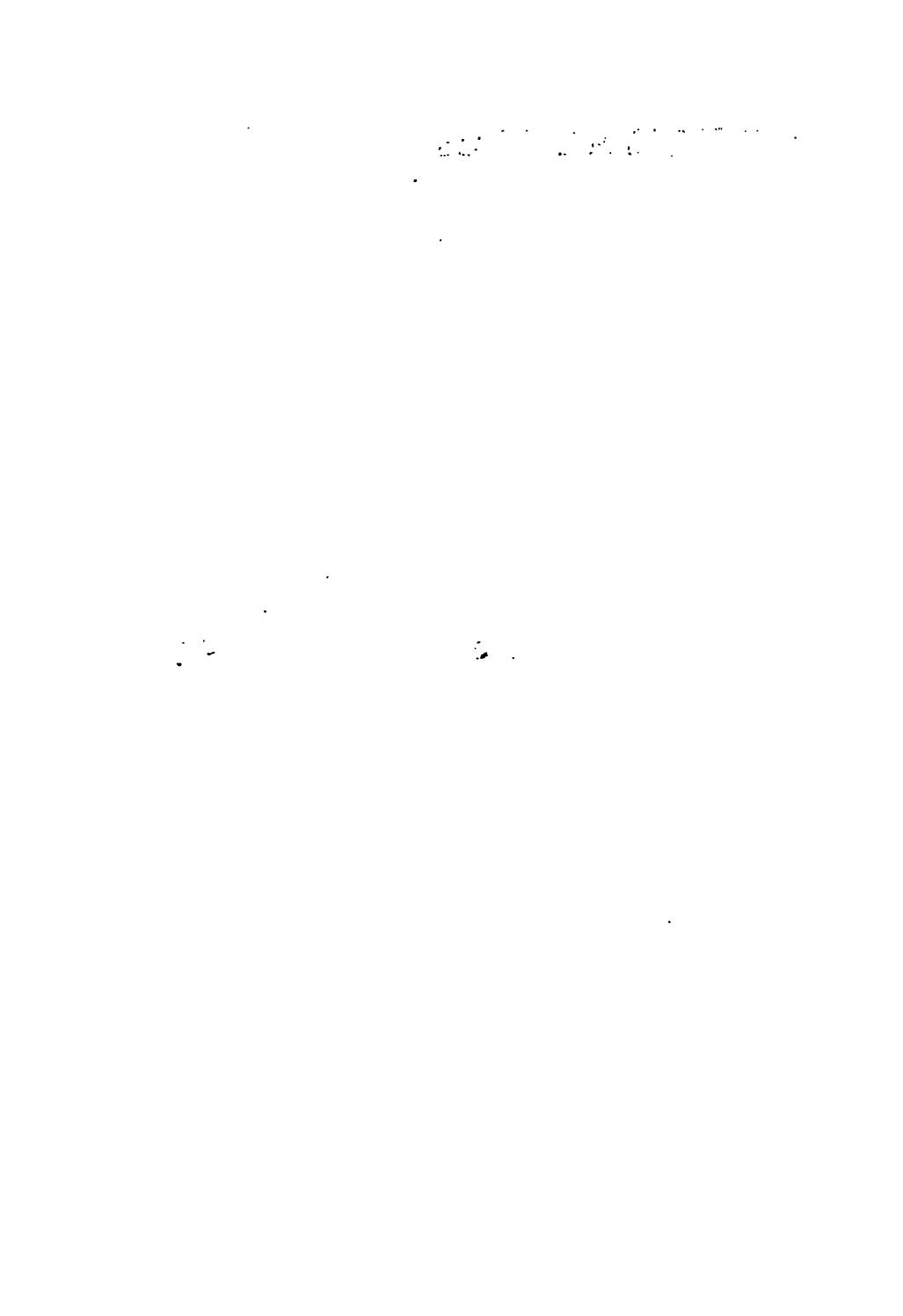


SCHOOL OF EDUCATION
LIBRARY

TEXTBOOK COLLECTION
GIFT OF
THE PUBLISHERS

STANFORD UNIVERSITY
LIBRARIES









LEAVES AND FLOWERS

OR

PLANT STUDIES FOR YOUNG READERS

BY

MARY A. SPEAR

LATE PRINCIPAL OF MODEL SCHOOL, STATE NORMAL SCHOOL,
WEST CHESTER, PENN.

DEPARTMENT OF EDUCATION
LELAND STANFORD JUNIOR UNIVERSITY

BOSTON, U.S.A.

D. C. HEATH & CO., PUBLISHERS

1893

When reading about a leaf, twig, or flower, it is essential that pupils see and handle specimens in order to receive and retain the thoughts expressed in a lesson. Without this examination of a plant or its parts, but little real knowledge will be gained.

Botanical specimens are abundant and inexpensive. Pupils should be encouraged to make collections for both school and home study. Collections of pressed leaves are valuable in winter.

Since many teachers have new classes and new pupils in September, this book has been arranged to begin with materials which may be easily obtained at that time.

A pupil in Second Grade may begin the study of leaves at the beginning of the school year, and continue the work during the fall term, using from pressed collections late in the season. In spring he is prepared to resume the study and to watch the growth and unfolding of buds.

“The study of Botany becomes more and more interesting the more we learn of it, and affords a constant and unalloyed intellectual gratification.”—GRAY.

If the study of this book leads any little child to have a love for the study of Botany, the writer is repaid for her labors.

CONTENTS.

	PAGE
A PETIOLE	1
A BLADE	2
AN OAK LEAF	3
MANY LEAVES	3
COLOR OF BLADES	5
SESSILE LEAVES	5
SESSILE LEAVES	6
IN THE WOODS	7
STIPULES	8
REVIEW	9
THE VEINS	10
AN IVY LEAF	11
A MIDDLE VEIN	12
VEINLETS	13
A PLANTAIN	14
THE USE OF VEINS	15
REVIEW	16
A NETWORK OF VEINS	16
NET-VEINED LEAVES	17
PARALLEL VEINS	18
PARALLEL-VEINED LEAVES	19
REVIEW	20

	PAGE
THE BASE OF A LEAF	21
THE APEX OF A LEAF	22
SHAPES OF LEAVES	23
IN A PARK	24
DIFFERENT SHAPES	25
A WIDE APEX	26
THE CALLA	28
THE ARROW-HEAD	29
A PEACH LEAF	30
AN APPLE LEAF	32
MANY FORMS	33
CORDATE LEAVES	35
THE CATALPA	35
REVIEW	37
MARGINS	38
CRENATE MARGINS	39
SERRATE MARGINS	40
DENTATE MARGINS	41
OTHER MARGINS	42
THE HEPATICA	44
LOBES	45
REVIEW	46
MULLEIN AND THISTLE	47
AUTUMN	49
NODES AND INTERNODES	51
GATHERING TWIGS	52
HOW BUDS ARE PLACED	54
ABOUT BUD SCALES	56
WATCHING LEAF BUDS	58
THE HORSE-CHESTNUT	60

CONTENTS.

vii

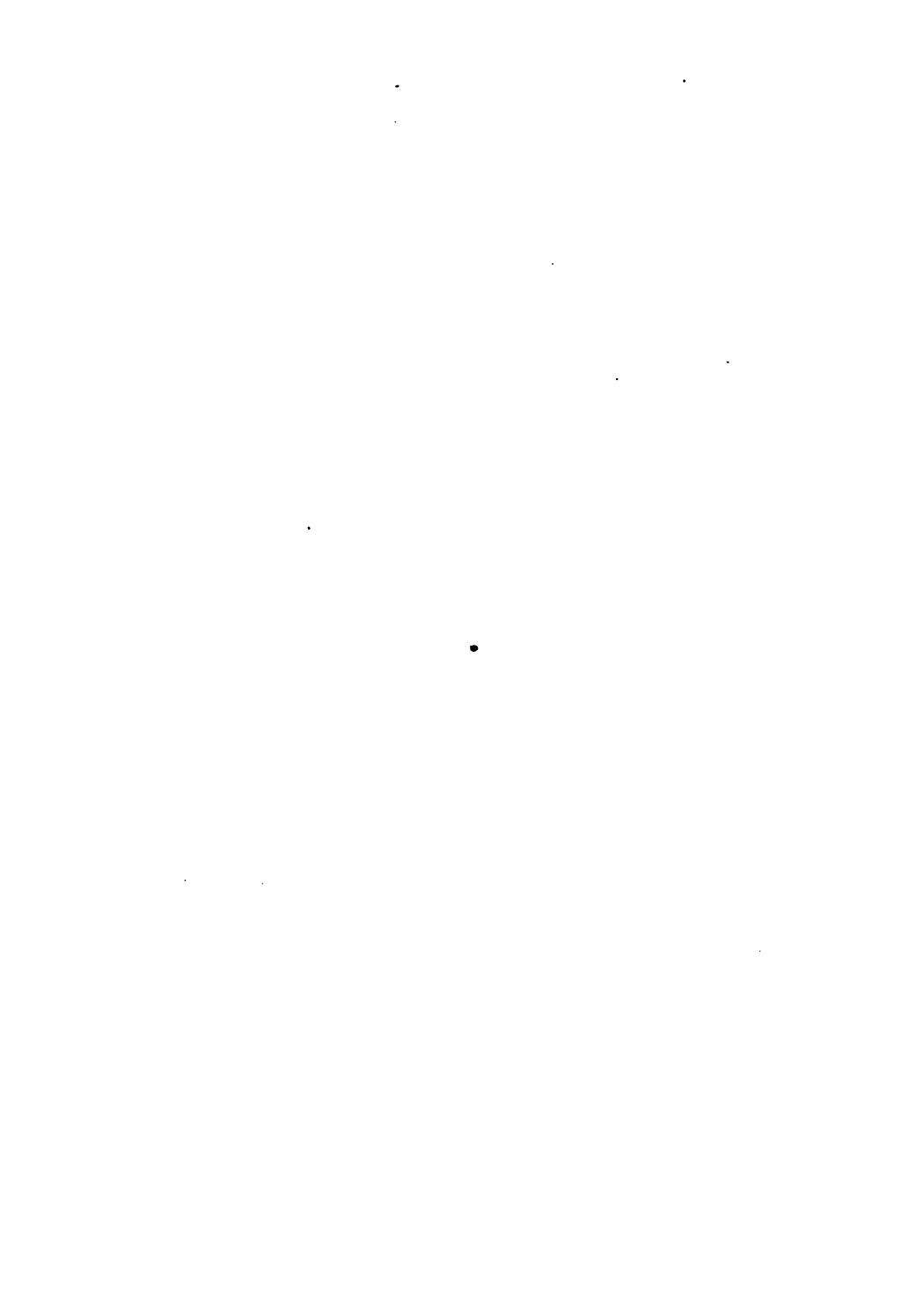
	PAGE
THE LILAC	61
HOW LEAVES ARE FOLDED	63
PARTS OF A FLOWER	65
THE CHERRY BLOSSOM	68
THE CALYX	68
THE COROLLA	70
KINDS OF COROLLA	72
THE PERIANTH	76
LILIES	78
STAMENS	78
MORE ABOUT STAMENS	81
THE PISTIL	83
FLOWER TIME	85
STEMS OF FLOWERS	86
KINDS OF CLUSTERS	88
SPRING	91
WILD FLOWERS	92
THE VIOLET	95
SUMMER FLOWERS	96
THE BUTTERCUP	99
LATER FLOWERS	100
SEPTEMBER	103

	PAGE
THE BASE OF A LEAF	21
THE APEX OF A LEAF	22
SHAPES OF LEAVES	23
IN A PARK	24
DIFFERENT SHAPES	25
A WIDE APEX	26
THE CALLA	28
THE ARROW-HEAD	29
A PEACH LEAF	30
AN APPLE LEAF	32
MANY FORMS	33
CORDATE LEAVES	35
THE CATALPA	35
REVIEW	37
MARGINS	38
CRENATE MARGINS	39
SERRATE MARGINS	40
DENTATE MARGINS	41
OTHER MARGINS	42
THE HEPATICA	44
LOBES	45
REVIEW	46
MULLEIN AND THISTLE	47
AUTUMN	49
NODES AND INTERNODES	51
GATHERING TWIGS	52
HOW BUDS ARE PLACED	54
ABOUT BUD SCALES	56
WATCHING LEAF BUDS	58
THE HORSE-CHESTNUT	60

CONTENTS.

vii

	PAGE
THE LILAC	61
HOW LEAVES ARE FOLDED	63
PARTS OF A FLOWER	65
THE CHERRY BLOSSOM	68
THE CALYX	68
THE COROLLA	70
KINDS OF COROLLA	72
THE PERIANTH	76
LILIES	78
STAMENS	78
MORE ABOUT STAMENS	81
THE PISTIL	83
FLOWER TIME	85
STEMS OF FLOWERS	86
KINDS OF CLUSTERS	88
SPRING	91
WILD FLOWERS	92
THE VIOLET	95
SUMMER FLOWERS	96
THE BUTTERCUP	99
LATER FLOWERS	100
SEPTEMBER	103



“Chide me not, laborious band,
For the idle flowers I brought;
Every aster in my hand
Goes home loaded with a thought.”

EMERSON.

LEAVES AND FLOWERS.

A PETIOLE.

HELEN and Frank are standing under a tree. It is a maple tree.

Some green leaves are on the ground. They are green maple leaves.

They fell from the maple tree, and are called maple leaves.

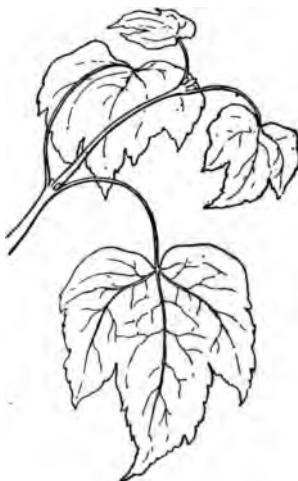
Helen picks up a leaf and gives it to Frank. She has another leaf in her hand.

Each leaf has a long stem. The stem of a leaf is called its petiole.

The petiole of a maple leaf is green.

Can you find a maple leaf?

Frank runs away to some other trees. They are oak trees.



He finds leaves on them. He takes some of the leaves to his sister Helen.

They are not like maple leaves. The trees on which they grew are not like maple trees.



A BLADE.

Here is an oak leaf with a short stem. Shall we call the stem a petiole?

It is green like the petiole of a maple leaf.

The stem of an oak leaf is not so long as the stem of a maple leaf.

An oak leaf has a short, green petiole.

What is the other part of a leaf called?

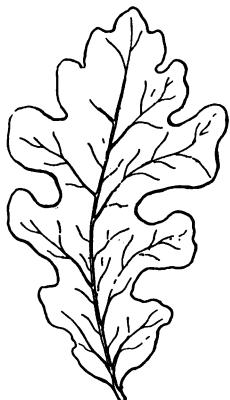
It is called the blade. The broad, green part of a leaf is the blade.

The blade of an oak leaf is thicker than the blade of a maple leaf.

Bring five leaves to the class to-morrow. Show and name their parts.

Bring some leaves with long petioles. Bring some with short petioles.

Make a drawing of an oak leaf.



AN OAK LEAF.

Helen found a pretty oak leaf. She put it into a book. She did this that she might keep it.

The blade of the oak leaf was dark green. It did not look like a maple leaf. It was shining.

Helen's oak leaf was small. The blade was just three inches long.

The petiole was very short. It was only one-half an inch long.

Some oak leaves are five inches long. Some oak leaves are more than five inches long.

The petioles of oak leaves are not so long as the petioles of maple leaves.

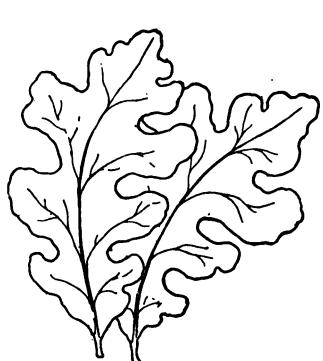
Can you find some oak leaves and some maple leaves?

Tell how their petioles are unlike.

MANY LEAVES.

Here are some leaves. I took two from an oak tree, and two from a maple tree. I took other leaves from an elm tree.

Each leaf has a petiole and a blade.
The blade of each leaf is green. The blade of an



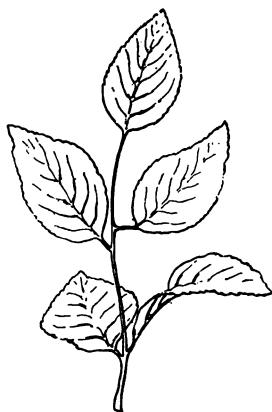
elm leaf is not so long as that of an oak leaf. It is not shining like an oak leaf.

The blade of an elm leaf is not so wide as the blade of a maple leaf.

The petiole of an elm leaf is not like the petiole of an oak leaf. It is not like the petiole of a maple leaf.

Can you make a drawing of an elm leaf?

Try to find two leaves that have long petioles, and two that have short petioles.



COLOR OF BLADES.

The broad part of a leaf is the blade. Most leaves have green blades.

The blades of some leaves are light green. Some kinds of leaves have dark green blades.

Sometimes the blades of leaves are red and yellow. Other leaves have pretty brown blades.

A leaf may have more than one color in its blade. Some leaves have green blades marked with white lines.

Green leaf blades are sometimes marked with red or brown lines.

When cold weather comes, green leaves change to red, yellow, and brown.

Maple leaves change to red and yellow. Oak leaves change from green to red and brown.

Does an elm leaf change to red, yellow, or brown?

What becomes of the leaves after they change color?

SESSILE LEAVES.

One day in the spring, Frank went out to the woods.

He found some pretty purple flowers. He carried these flowers and their leaves to his sister Helen.

She looked at the leaves but did not see any petioles. She thought the petioles had forgotten to grow. Perhaps they would grow when the leaves were older.

Frank and Helen took the leaves to their mamma. Mamma said that some leaves never have petioles. Such leaves grow close to a stalk. They look as if they were sitting on a stalk.

Frank said that when he found leaves without petioles, he would call them sitting leaves.

"That will be right," said mamma, "but sessile is a better name for them."

Sessile means sitting.



SESSILE LEAVES.

Some leaves do not have petioles. These are called sessile leaves.

Sessile leaves grow close to a stalk. They look as if they were sitting on a stalk.

Frank and Helen tried to find some sessile leaves.

They went to mamma's flower garden. Here they found a pretty pink flower. It grew on a low plant.

The leaves on this plant did not have petioles. They were sessile leaves.

Mamma had two kinds of marigolds in her garden. One kind had sessile leaves. One kind had leaves with petioles.

Frank went to the fields to look for leaves. He found some that had petioles. He found some that were sessile.

He found the low cornel or bunchberry. A bunch of scarlet berries was just above some leaves.

Frank thought the leaves on this plant were sessile. He pulled one off and saw a very short petiole. The leaf was nearly sessile.



IN THE WOODS.

One warm day in May, mamma, Helen, and Frank went to walk. They went to the woods for wild flowers.

They found Solomon's-seal with its pretty white flowers. The flowers looked like little bells.

Helen and Frank looked at its leaves. They were growing close to a stalk. They seemed to be sitting

on a green stalk. The leaves of Solomon's-seal are sessile.

Frank found some flowers near the trunk of a tree. They were pale yellow bells. Mamma called them wild oats, or bellwort.

The bellwort had light green leaves. All the leaves were sessile.

Helen found a flower of a rich yellow color. It was a marsh marigold. Sometimes it is called a cowslip, but that is not its right name.

Where the marsh marigold grew, the ground was wet. It was in a meadow and near a brook.

The dark green leaves of a marsh marigold are thick and glossy. Those which grow nearest the flowers are sessile. The lower leaves have petioles.

STIPULES.

One morning Helen went to look for sessile leaves. She went to some bushes that grew near her home.

Last spring, one of these bushes had pretty red flowers. Helen called it a Japan quince. It had another long name which she could not tell.

She took a leaf from this bush to see whether it was sessile. The leaf had a petiole.

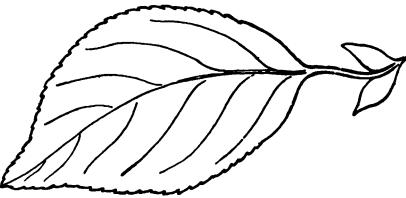
When Helen looked at its petiole, she saw two little bits of green on it. These bits of green looked like a pair of leaves growing from the petiole.

They looked like leaf blades, but were very small. There was one on each side of the petiole.

They grew near the end of the petiole. They were close to the place where it joined the stalk.

These small leaf-like bodies are stipules.

Can you find leaves with stipules?



—•—•—•—

REVIEW.

What part of a leaf is the blade?

Tell some leaves that have broad blades.

Tell some that have long blades.

Tell some that have round blades.

What leaves have dark green blades?

What kinds have light green blades?

Name some leaves which have shining blades.

Name two leaves which have long petioles.

Name two which have short petioles.

Name two which have no petioles.

What are such leaves called?

What does sessile mean?

What vine has sessile leaves?

What are stipules?

Name some leaves that have stipules.



THE VEINS.

Look at this maple leaf. There are some hard lines in its blade.

These lines are hard, like a stem or petiole. They seem like branches coming from a petiole.

There are other smaller branches coming from these.

The five large branches come from the petiole, and look like the sticks of your fan.

Of what use are the sticks in your fan?

They make it spread out, and these little branches in the blade make a leaf spread out.

The sticks in your fan are made of wood. Are the branches in this leaf made of wood?

We will call them woody.

The five large branches in the blade of a maple leaf are called veins.

There is one vein running straight from the petiole through the middle of the blade.



AN IVY LEAF.

Here is an ivy leaf. It did not grow on a tree, like an elm leaf. It grew on a vine.

The vine on which it grew is as long as two sides of a room.

This ivy leaf has a petiole three inches long. Some ivy leaves have longer petioles. Some ivy leaves have shorter petioles.

Is the ivy leaf sessile?

The blade of this leaf is about one-half as long as the petiole.

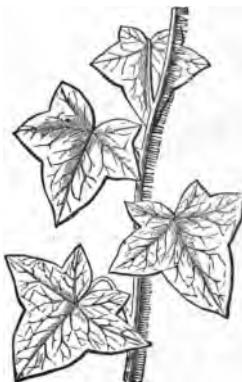
It has five points.

An ivy leaf like this is dark green on its upper side. The color is not so dark on its under side.

There are five large, white veins in the blade. One of these white veins is in the middle of the blade. It is the middle vein of the leaf.

This ivy leaf has other white veins. They are smaller than the five large veins.

The blade of an ivy leaf is smooth.



A MIDDLE VEIN.

In this maple leaf, there are five little branches. They come out from the petiole, like the branches of a tree.



These little branches are called veins.

There is one vein running straight from the petiole. It passes through the middle of the blade.

Look at an oak leaf. Do you see any veins?

There is one large vein in the middle of an oak leaf.

Look at a beech leaf, an elm leaf, and a leaf from a cherry tree. Each of these has a large vein in the middle of its blade.

Look at lilac leaves and grape leaves to see whether they have middle veins.

A middle vein is called a midvein.

Frank has looked at a great many leaves. He has looked at a great rhubarb leaf. It has a very large vein in the middle of its blade. This is its midvein.

Frank thinks the middle vein of a rhubarb leaf is as large as one of his fingers.

Helen has found some small leaves. She sees a midvein in each.

She cannot find a leaf without a midvein. Perhaps she may find one to-morrow.

Helen and Frank look at a great many leaves. They try to find one without a midvein.



VEINLETS.

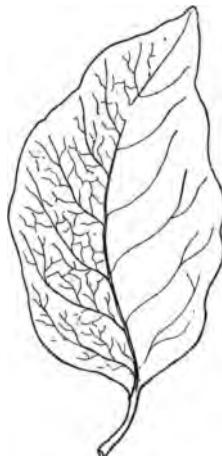
A middle vein is called a midvein.

Look at an oak, an elm, or a beech leaf. Little branches or veins come out from the midvein. Other, smaller veins come from these.

These smallest branches are called veinlets. This word means little veins.

All veinlets are not the same size. Some are so small they are not easily seen.

Some leaves have more veins than others. A maple leaf has five large veins. It has many small veins or veinlets.



Some leaves on a sassafras tree have three large veins and many veinlets. You may see other sassafras leaves having only one large vein.

Bring leaves to the class to show the veins and veinlets in them.

Make drawings of the veins and veinlets in leaves.



A PLANTAIN.

Frank found a pretty green plantain leaf. It was growing close to the ground.



Plantains often grow near a door-step. In the country, they grow along the roadside. Sometimes they are called rib-worts.

A plantain leaf has grooves in its petiole. Look at a plantain leaf to see what grooves are.

Frank broke the petiole of a plantain leaf. There were some little strings in it. These strings ran far up into the blade.

They were in the veins of the leaf.

These little strings were very strong. Frank pulled

them, and this made the blade of the leaf curve. Then it looked like the bowl of a spoon.

Frank's leaf had seven large veins. It had many veinlets. It had a midvein which was larger than any other vein.

There is more than one kind of plantain. Some kinds have wide leaves. Other kinds have leaves that are long and not very wide.

—••••—

THE USE OF VEINS.

Veins and veinlets keep a leaf spread out. When leaves spread out, they make shade for us.

When veins are broken, water or juice comes out of them. This water or juice is called sap.

There are veins and veinlets in every part of a blade. Sap goes to all parts of a blade through veins and veinlets.

Small veins have but little sap. If the veins are large, there may be much sap in them.

Spaces between veins and veinlets are filled with the soft green blade.

Where there are many veins and veinlets, there is much sap and a great deal of the soft green blade.

Break some veins, and you can see the sap.

What color is it?

REVIEW.

What are the branches in leaves called ?
Of what use are these branches ?
How many midveins are in one leaf ?
What is a midvein ?
Tell some leaves that have large midveins.
Tell some that have small midveins.
Have you ever seen a leaf without a midvein ?
Tell some leaves that have more than one large vein.
What are veinlets ?
What leaf have you seen having many veinlets ?
What is in the veins of leaves ?
What did Frank find in the veins of a plantain
leaf ?

A NETWORK OF VEINS.

Did you ever hold a leaf between your eyes and the light ?

Helen held up a peach leaf to see its veins and veinlets. It looked like lace with a green cover over it.

In the leaf there were tiny veins that seemed to join other little veins. These veinlets crossed one another in every way. Helen thought of threads in a piece of lace.

She held other leaves between her eyes and the light
Some had veinlets very close together. In others the
veinlets were farther apart.

Helen told her mamma that these leaves looked like
tiny fish-nets.

Mamma said, "When veins and veinlets join one
another, like these, a leaf is called net-veined."



NET-VEINED LEAVES.

When veins and veinlets run into one another, they
make a net-veined leaf.

Helen and Frank think
they will know net-veined
leaves when they find
them. If they want to
know when a leaf is net-
veined, they will hold it
between their eyes and
the light.

When veins and vein
lets seem to make a lace-
work all over the blade, the leaf is net-veined.

"Perhaps all leaves are not net-veined," said Helen.

"I never thought about that," said Frank.



Now Helen and Frank will look at different kinds of leaves to see whether they are net-veined.

If they can find some which are not net-veined, they will want to know what those are called.

They will look at the leaves of a birch, a cherry, a lily of the valley, and at some blades of grass.



PARALLEL VEINS.

In the garden were some lilies of the valley.

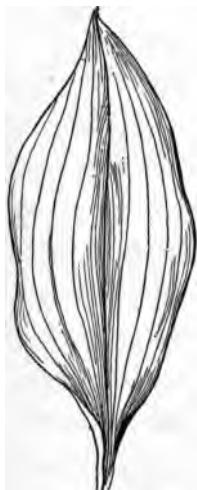
Little white bells hung from the upper part of their stems. These white bells were the flowers. They were very fragrant.

Mamma gathered some of these flowers and their leaves. She gave a leaf to Helen, and told her to look at the veins.

The midvein and the other veins seemed to run side by side.

Helen could not see any branching veins. She could not see any network of veins. It was not a net-veined leaf.

Mamma told her that when veins run side by side, like these, they are called parallel veins. Many kinds of leaves have parallel veins.



Helen will look for parallel-veined leaves. Sometimes she will find those in which the parallel veins are nearly straight. They are curved but little.

At other times she will find veins with double curves. If these veins run side by side, the leaf will be parallel-veined.



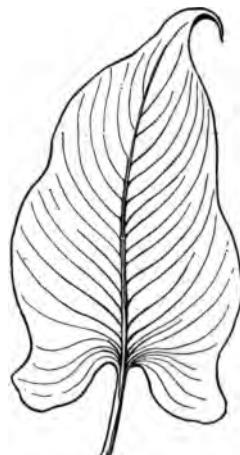
PARALLEL-VEINED LEAVES.

Helen has been looking at many leaves. She has looked at the veining, to see whether a leaf is net-veined or parallel-veined.

In some leaves she finds parallel veins. They are like those in a lily of the valley.

She finds other leaves having parallel veins, but the veins do not run the same way as the mid-vein. Helen looks at a calla leaf. Its veins are side by side. They branch out from the midvein and run towards the edge of the leaf.

The veins on one side of the midvein all run the same way, towards the edge of the leaf. They do not branch out in different ways like a net-veined leaf.



When Helen tears a calla leaf, it tears parallel to its veins. Then she knows it is a parallel-veined leaf.

Helen has learned there are two kinds of parallel-veined leaves. One kind has all its veins running the same way as its midvein. Another kind has veins side by side from the midvein to the edge of the leaf.

Can you find a lily leaf that is parallel-veined? Try to find a lily leaf that is net-veined.



REVIEW.

How can you hold a leaf to see its veining?

How do you know that a leaf is net-veined?

What makes the network?

In a net-veined leaf, are the veins large or small?

How do you know that a leaf is parallel-veined?

Are parallel veins straight or curved?

What kind of veining do you find in a blade of grass?

Is an elm leaf net-veined or parallel-veined?

Look at a leaf from Indian corn, then tell whether it is net-veined or parallel-veined.

THE BASE OF A LEAF.

Look at these white birch leaves. There is one large vein in each. This large vein is the midvein.

The veins next in size to the midvein are near the petiole. They branch out from the midvein.

The blade of a white birch leaf is wider near its petiole than in any other part. This is the broad part of the leaf.

That part of a blade nearest the petiole is called the base of a leaf. A white birch leaf has a broad base.

A white birch leaf has its largest veins in its base. Helen thinks there must be more sap in these veins than in the others. Why does she think so?

Helen tries to find another leaf that has a broad base. There is a sunflower in the garden. On its top, there is a large blossom. This blossom has a brown middle with a bright yellow circle around it.

The sunflower is so tall, Helen cannot reach its top. She can reach some of its leaves. She looks at the base of one. It has a broad base.

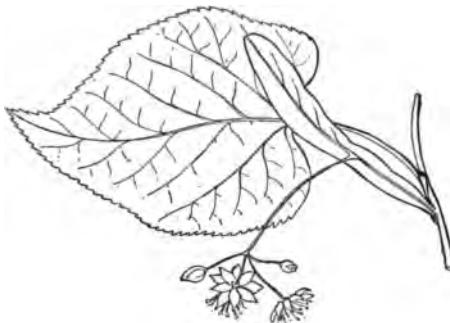
Can you name another leaf which has a broad base?



THE APEX OF A LEAF.

Frank has found many leaves that have broad bases. Leaves from a sycamore, a tulip tree, and a poplar tree have wide bases. The blade of a linden leaf is wide near its petiole.

Frank has looked at all these leaves. He has found large veins in the base of each. These veins are joined to the midvein near the petiole.



A linden leaf has the largest part of its midvein in the base. The smallest part of its midvein is in the apex of the leaf.

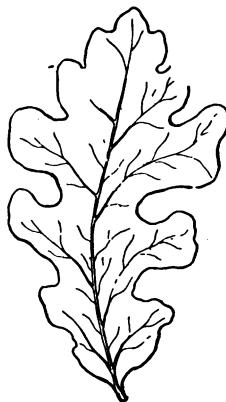
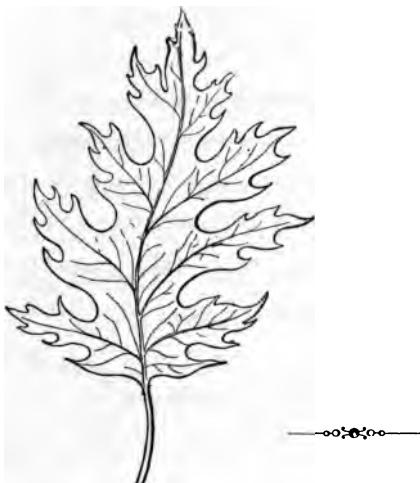
That part of a blade next the petiole is called its base, and the other end of the blade is its apex.

The apex of a white birch leaf is a very long point. The apex of an elm leaf is pointed.

Frank found two kinds of oak trees. He looked at a leaf from one of them. It had a pointed apex. Leaves on the other tree were not like this. Each had a rounded apex.

Frank will look at a great many leaves to see whether their bases are alike. When he is learning about the base of a leaf, he will learn about its apex, also.

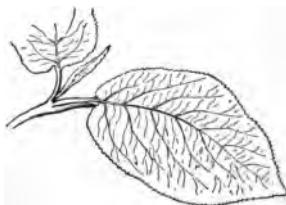
Try to find a leaf which has a round apex. Find one having a pointed apex.



SHAPES OF LEAVES.

All leaves are not widest at the base. Some are widest between the base and apex.

Look at a leaf from a plum tree. You will see it does not have a broad base like a white birch leaf. Its widest place is between the base and apex.



The shape of a plum leaf is oval. A pear leaf is oval, also.

An elm leaf has a narrow base. There are short veins and veinlets near the petiole. These veins are not very large. The largest veins in the leaf are above these. The widest part of an elm leaf is above its base.

A willow leaf is long and narrow. It has a rounded base. The base is not wide.

A willow leaf is lance-shaped.

Different shapes of leaves have names. Those shaped like a willow leaf are called lanceolate, or lance-shaped. A peach leaf is lanceolate.

Those shaped like a leaf from a plum tree are called ovate leaves. Ovate means oval with the lower end largest. It has the outline of a hen's egg, cut through lengthwise.

Of what shape is a leaf of the milkweed?

Name a leaf that is ovate.

Name a leaf that is lance-shaped.

What other name has that shape?



IN A PARK.

Helen and Frank went to walk in a park. They knew the names of some trees which they saw there. They knew the maple, with its spreading leaves; and the oak, which had dark green, shining leaves,

They knew the pretty lindens and the elms. One elm tree was shaped like a great vase. Another elm tree looked like a great umbrella.

They saw the tall, dark pine trees, with leaves like needles.

When they came home, they told their mamma the names of trees which they knew. They told her how many of each they had seen.

There were five oaks and seven maples. How many oak and maple trees were there?

They saw one-half as many elms as oaks and maples together. How many elm trees did they see?

They counted one-half as many lindens as elms. How many lindens did they count?

There were as many pine trees as elms, and two more. How many pine trees were there?



DIFFERENT SHAPES.

Frank has a great many leaves to-day. He took some of them from trees, some from shrubs, and some from little plants.

What a great number he has! How many different shapes! Every leaf is net-veined, yet they are not alike.

Each leaf has a midvein from base to apex, but some of the leaves are wide at the base, and some are narrow.



Each leaf has veins that branch out from the midvein. Then there are other veins and veinlets coming from these.

In all these leaves the longest veins branch out from the base of the midvein. But all do not have broad bases.

There are some in which the long veins branch out like a white birch leaf. These have broad bases.

There are others having long veins which start at the base. Instead of branching out they turn and grow towards the apex.

Such leaves do not have a broad base. They are wider near the middle of the blade.

Can you find a leaf of this kind?



A WIDE APEX.

One day Frank and Helen went to look for net-veined leaves. They wanted to find one with a wide apex.

They wanted to find one having short veins in its

base, and longer veins in its apex. They thought a leaf of this kind would have a wide apex.

In mamma's garden, Helen found some small plants. All their leaves were growing near the ground.

Helen looked at one of the leaves. She saw it was wider at its apex than at its base.

Its longest veins were near the apex. All the veins in its base were short. The base was very narrow. Helen picked some of these leaves to show to her brother.

Frank, also, had been looking for a wide apex. There were some fine shade trees growing near the house. He picked a thick leaf from one of these trees.

The leaf was dark green on its upper side, and brownish on its under side. Frank could easily see its veins. Those in the base were short. Those in the apex were long.

Frank and Helen will try to find other leaves shaped like these.



THE CALLA.

Helen has three kinds of leaves. These are violet, white birch, and lilac leaves. Each is widest at its base, and is net-veined.



Frank wants to know whether every leaf with a broad base is net-veined.

Helen does not know, so the children go to ask mamma.

Mamma tells them that they must use their eyes to find out.

Helen goes to the greenhouse, and Frank takes a ride into the country.

Helen sees a leaf with a broad base. It is the leaf of a calla. She knows this leaf is parallel-veined. Its veins are side by side from the midvein towards the edge of the blade.

When Helen holds a calla leaf to the light, she sees tiny veinlets crossing from one vein to another. They do not branch out as in a net-veined leaf. They are nearly straight, and run side by side.

A calla leaf has a broad base and is parallel-veined.

A violet, a white birch, or a lilac leaf has a broad base and is net-veined.

All leaves that have broad bases are not net-veined.



THE ARROW-HEAD.

Frank went to the country to look for parallel-veined leaves. He wanted to find some with broad bases.

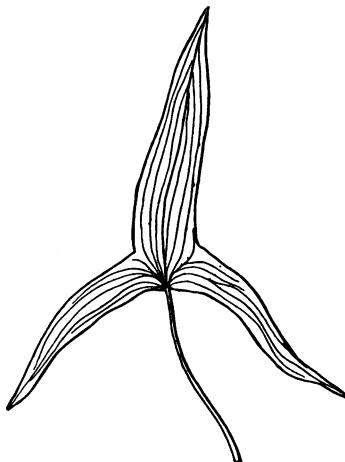
He went near a small pond. The land about this place was low and wet. It was sometimes called a marsh and sometimes a swamp.

Here Frank found some snow-white flowers. They were on a plant which grew near the edge of the pond.

He saw an odd kind of leaf on this plant. Its veins did not show very plainly.

When he held it up between his eyes and the light, he saw it was parallel-veined.

The veins were not large. They looked like threads.



Most of them started from the petiole and ran side by side to the apex.

A few long veins started from the petiole, but did not turn upward towards the apex. They did not spread out to make a broad base. They turned downward.

The plant that has this kind of leaves is an arrow-head. Some people think its leaves look like the points or heads of arrows.

Frank found other plants growing in the swamp. Many of them had parallel-veined leaves, with broad bases.

He took some of these leaves home to show to Helen. Now Frank knows that every leaf which has a broad base is not net-veined.

A leaf with a broad base may be net-veined or parallel-veined.

A PEACH LEAF.

A peach leaf is long and narrow. Its midvein is thick and round at the base. At the apex, it is small, like a fine thread.

The longest veins in this leaf are about half way between its base and apex. It is a lance-shaped or a lanceolate leaf.

A peach leaf is a net-veined, lanceolate leaf. Are there other lanceolate leaves having net veins?

Yes, Frank knows where there are some wild asters. The flowers are pale purple. These asters have net-veined, lanceolate leaves.

Helen has found a weed. Mamma calls it "lady's-thumb." Its leaves are green, and each has a dark, heart-shaped spot near the middle. The leaves are lanceolate.

Frank has some lily leaves. They are lanceolate, but not net-veined.

Some lanceolate leaves are net-veined and some are parallel-veined.

Mamma wants Helen and Frank to know about the shapes of leaves. She wants them to know about those which grow on the trees, shrubs, or small plants near their home.

If they are in a strange place, and see a leaf like one of these, they will know its name. It will seem like an old friend.

They can learn to know a tree or a plant by its leaves. Then as soon as they see a leaf, they may know the name of the tree, shrub, or plant on which it grew.

Helen has found some leaves having nearly the same shapes, but their veining is not the same.



She thinks she will press different kinds of leaves in a book. She can look at them when she does not have fresh leaves.

Helen will have a great many pressed leaves. She will see whether those of the same shapes have the same kinds of veining.

She can see whether some net-veined leaves have shapes like some parallel-veined leaves.

Where is the widest part of a poplar leaf?

Where are the largest veins in a willow leaf?

Make a drawing of a beech leaf.



AN APPLE LEAF.

Last week Helen and Frank went to visit their cousins, Sara and Arthur.

They went out to play under an apple tree. Sara and Arthur did not know much about leaves. They asked Frank to tell them some things he had learned.

Frank showed them an apple leaf. Its blade was two and one-half inches long. Its petiole was one inch long. He told them which part of the leaf was the base, and which was the apex.

Frank showed veins and veinlets in the blade. He told Sara and Arthur about the midvein. He said,

"It is the vein running from the petiole through the middle of the blade."

Arthur held a leaf between his eyes and the light. He could see it was a net-veined leaf, because the veins crossed each other like network.

The leaf which Arthur held was dark green on its upper side. The color was not so dark on its under side.

Sara found some light green leaves growing on the ends of twigs. There was something on them which looked like wool. When Sara rubbed the leaf, this wool came off and the leaf was bright green and shining.

Frank said that an apple leaf is an ovate leaf. Arthur knows another kind of tree that has ovate leaves.



MANY FORMS.

Frank and Helen had a book in which they had pressed a great many leaves. These leaves had different forms.

One day they took these leaves out of their book. Mamma told them that each form had a name.

Frank and Helen wanted to learn the names of all the forms.

Mamma thought there were more than they could remember. She told them it was best to put the leaves into three groups. She helped them do this.

Into one group they put those leaves that were widest between the base and the apex. They had apple, plum, quince, willow, horsemint, orange, and blueberry leaves.

Into another group they put the leaves which had broad bases. These were catnip, liverwort, birch, violet, and morning-glory leaves.

Into the last group they put those leaves which were widest near the apex. All they had for this were some large, leather-like oak leaves.

Frank thought that a leaf from the sheep-sorrel would belong to the last group. He is going to the fields to get one; then he will know.

Every day the children will try to add to their groups of leaves. When they have a leaf, they will put it into the group to which it belongs.

CORDATE LEAVES.

Helen has some leaves, and each has a broad base. She sees that the broad bases are not alike.

The base of a lilac leaf is wide, but it is not like the base of a white birch leaf. A lilac leaf looks as if a piece had been taken out of its base. It is a heart-shaped blade.

Helen has leaves of a violet and a morning-glory. These, too, are heart-shaped. A tall sunflower is growing near the house. She will look at its leaves to see whether they belong to the heart-shaped class.

Frank knows where there is a linden. He will find a great many heart-shaped leaves on that.

Another name for heart-shaped is cordate.

Helen and Frank will find many cordate leaves. They will make drawings of them.

Can you find a cordate leaf and make a drawing of it?



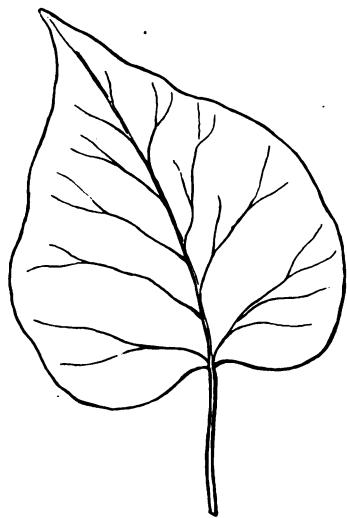
THE CATALPA.

Early one morning, Helen and Frank went out to find cordate leaves. It was autumn, and the days were cool.

There were some trees growing near the house.

Their leaves had changed from green to red and yellow. On some trees the leaves had changed to brown.

Many of the red, yellow, and brown leaves had fallen. They were lying on the green grass. This made the lawn look like a pretty carpet.



Looking down amongst the brown leaves, Helen saw one that was large and green. It was a beautiful heart-shaped leaf.

This leaf looked as if it had been cut from a piece of green silk. It had a silky lustre.

Helen picked it up, and then looked to see whence it came.

She saw a large tree. The leaves on it were like the one she held in her hand. Some of these leaves were very large. They were larger than any oak leaf.

Helen did not know the name of this tree. She took a leaf to mamma, and asked its name.

Mamma told her it was a catalpa tree. Some people call it Indian bean.

The catalpa has heart-shaped or cordate leaves.

REVIEW.

Name five leaves having broad bases.

Name five which are widest near the middle of their blades.

What leaves are nearly round ?

Did you ever see a leaf from a tulip tree ? What kind of an apex has it ?

Name a leaf which has a wide apex and a narrow base.

Tell the name of some leaf which is very long and has a narrow base.

Tell of some leaf which is ovate, or with an outline that is egg-shaped.

Make a drawing of an ovate leaf.

Make a drawing of an elm leaf.

How do the veins appear on the under side of an elm leaf ?

How do they appear on its upper side ?

Of what shape is a willow leaf ?

What kind of veining has it ?

Make a drawing of some lanceolate leaf.

Name two lanceolate leaves you have seen.

What is the shape of a peach leaf ?

Name four cordate leaves.

In what part of their blades can you find the largest veins ?

Are the four cordate leaves which you have named net-veined or parallel-veined?

Can you find both net-veined and parallel-veined leaves with heart-shaped bases?



MARGINS.

A violet, a morning-glory, and a lilac have cordate or heart-shaped leaves.

The leaf of a violet is not like the leaf of a lilac. Its edge looks as if little scallops had been cut all around it.

A lilac leaf has a whole edge. There are no cuts in it. Leaves of a honeysuckle and a morning-glory have whole edges like a lilac leaf.

The edge of a leaf is its margin.

A catnip leaf is cordate. In its margin there are pretty little curves, like those in a violet leaf. Its color is not the same as a violet leaf.

Ground ivy is a common plant. It grows in gardens and around houses. You may see it creeping along on the ground or up on walls.

It has a pretty leaf with a heart-shaped base. The apex is broad and round. Little scallops are cut around its margin. They are like the scallops in the edge of a violet leaf.

Write the names of five kinds of leaves having whole margins.

Write the names of five kinds of leaves having cut margins.

Find two parallel-veined leaves and tell what kind of margins they have.



CRENATE MARGINS.

Frank found a pretty leaf. It came from a plant in grandma's garden.

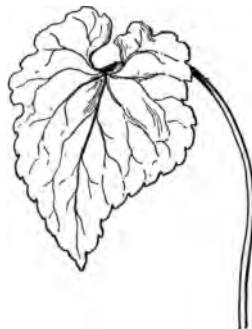
This leaf had an odor like lemons. Grandma told Frank that it was called lemon balm.

Margins like those of the violet, catnip, and lemon balm are crenate.

When the margin of a leaf has broad, rounded notches, it is crenate.

Look at geraniums. How many kinds have leaves with crenate margins? You may find crenate margins on horseradish leaves.

Do you know any other leaves which have crenate margins?



Make a drawing of some leaf having a crenate margin.

While looking for crenate margins, you may find leaves having other kinds of margins.

The edges of some leaves are cut like the edge of a saw, with its sharp teeth pointing forward towards the apex.

Leaves of an elm and an apple tree have margins of this kind. Perhaps you may find other leaves with edges notched like a saw.



SERRATE MARGINS.

One day Helen went out to find leaves having crenate margins.

She found five different kinds which had broad, rounded notches in their margins.

She looked at each to see whether it was net-veined or parallel-veined. Not one of her five leaves had parallel veins.

When she was looking for crenate margins, she saw leaves having other kinds of margins.

She took some leaves from an elm tree. These did not have crenate margins.

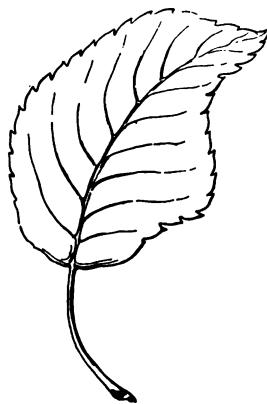
The margin of an elm leaf is notched like the

teeth of a saw, with the teeth pointing towards its apex.

Helen took some leaves from a cherry tree, and some from an apple tree. She did not put these leaves with those which had crenate margins.

Leaves from an elm, a cherry, and an apple tree have serrate margins.

When the margin of a leaf has sharp teeth pointing towards the apex, like the teeth of a saw, it is saw-toothed or serrate.



DENTATE MARGINS.

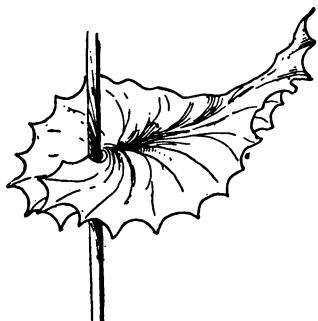
When summer days become shorter, the wild asters are in bloom.

We may find them growing in fields and by the roadside. Some are white and some are purple. A little spot of yellow is in the centre of each flower.

Helen likes to gather these pretty flowers. One day she gathered a large bouquet for her mamma.

While she was picking flowers, she looked at some aster leaves. She saw their margins were neither crenate nor serrate. They were toothed or notched.

Some margins had sharp teeth, which did not point forwards. They did not point towards the apex, like teeth in a serrate margin. They pointed outwards from the middle of the leaf. These margins were dentate.



When the margin of a leaf has sharp teeth pointing outwards, it is dentate.

The leaf of a dandelion has a dentate margin. There is another plant which has yellow flowers, and its leaves have dentate margins. The name of this plant is hawkweed. It grows in dry and rocky fields.

If you use your eyes, you will find many other leaves having dentate margins.

Look at the veining of leaves with dentate margins. Are they net-veined or parallel-veined ?



OTHER MARGINS.

The edges of leaves are not alike. Helen has found some that are like aster leaves, with dentate margins. She has seen others with whole or entire margins, like a honeysuckle or a lilac leaf. She knows some leaves that have crenate margins, and some that have serrate margins.

Helen has learned about other margins. The long leaves of a dock have wavy margins. Some leaves have crisped or curled margins.

Sometimes leaves that grow on the same plant do not have the same kind of margins. Helen once found three kinds of margins on the leaves of one plant. It was the Iberis or candytuft. Its leaves had entire margins, wavy margins, and serrate margins.

She would often find a single leaf with two kinds of notches on its margin. To give a name to these margins, she would put together the names of the different notches.

Leaves like these were on mamma's geranium. Helen looked at one, and saw a part of the margin was crenate and a part of it was dentate. It was a crenate-dentate margin.



THE HEPATICA.

Helen's mamma has a garden which she calls her wild garden. She gives it this name because all the plants in it were brought from the woods and fields.

In this garden there is hepatica or liverwort. Early in spring the hepatica has pretty blue flowers.

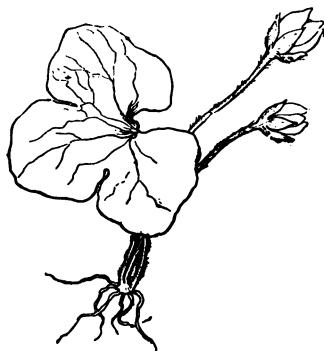
When the plant is in blossom, there are some of last year's leaves on it. Leaves stay on the hepatica all winter.

One day Helen took a leaf from the hepatica. It seemed to grow from the root of the plant.

This leaf was thick and tough, like leather. It was a net-veined leaf.

The base of the blade was broad, and on each side of the petiole there were curves. The base of the blade looked as if a piece had been cut out of it.

There were two other cuts in the leaf blade, one on each side. If there were no cuts in the blade, it would be shaped like a triangle.



LOBES.

Helen found other leaves which had deep cuts in their margins. These cuts would reach about half-way to the midvein.

These cuts were always between the large veins of a leaf and never across them.

Is there a name for the parts of a leaf that are between the cuts?

Helen's mamma told her that the parts of a blade between the cuts are called lobes. Sometimes a leaf has both large lobes and small lobes.

Frank gathered some oak leaves. He also had some maple, sassafras, grape, currant, and hepatica leaves. Some of these had large lobes, and some had small lobes.

All leaves do not have the same number of lobes. A maple leaf is five-lobed. The hepatica is three-lobed.

Some leaves on a sassafras tree have three lobes. The blades of these leaves are shaped like a wedge. Other leaves on the same tree are ovate and have an entire margin.

Helen has seen leaves which have rounded lobes. She has seen them with pointed lobes.



The space between two lobes is called a sinus. Sinuses are not alike, because in some leaves the lobes spread far apart, in others the lobes are close together.

If lobes spread far apart, a leaf has shallow sinuses. If lobes do not spread far apart, a leaf has deep sinuses.

Look at some lobed leaf. Are the sinuses shallow or deep?

Tell the name of some tree which has lobed leaves.

Tell the name of a common shrub which has lobed leaves.

REVIEW.

What is the margin of a leaf?

What kind of a margin has a laurel leaf? A horseradish leaf? A willow leaf? A tulip leaf? An Indian corn leaf?

What is an entire margin? A serrate margin? A crenate margin? A dentate margin?

Name some vine which has leaves with dentate margins.

Name some tree whose leaves have serrate margins.

Name a garden plant whose leaves have curled margins.

What small plant in a greenhouse or a flower garden has leaves with wavy margins?

How many lobes has a sassafras leaf? A cucumber leaf? A hop leaf?

What are the sinuses of a blade?

When does a blade have deep sinuses?

When are the sinuses shallow?

Draw an oak leaf.



MULLEIN AND THISTLE.

One day Helen and Frank were riding in the country. By the roadside they saw a plant which had a tall stem.

The children knew the name of this common plant. It was a mullein. It had golden yellow flowers. These flowers grew near the top of the stem and close to it.

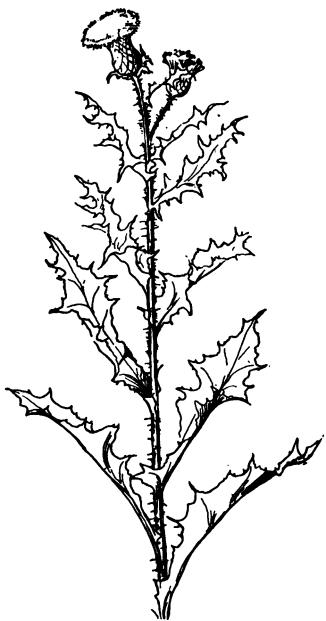
The leaves on this plant were a very light green. They looked as if they were covered with wool. When Helen touched one of them, she thought of woollen cloth. They were woolly on both sides.



The midvein of a leaf was large. The lower part of it was growing on the tall stem. The bases of the leaves grew downward on the stem or stalk. This made the stalk look as if it had wings.

Helen called it a winged stalk. She has seen other leaves grow to a stalk in this way. Such leaves are decurrent.

Frank saw another plant which had decurrent leaves. It grew by the roadside,



and had large, purple flowers. These flowers were very pretty, but Frank did not touch them. There were too many sharp spines on them.

The leaves of this plant were decurrent. Their bases grew downward on the stalk. Along their margins there were sharp spines. It was a thistle.

Both thistle and mullein have decurrent leaves.

In some gardens you may see a plant having pale yellow flowers. Its leaves are decurrent. Can you tell the name of this plant?

AUTUMN.

A sultry summer had passed, and the cool days of autumn had come. The morning sun often shone on blades of grass glittering with white frost.

Leaves on the trees were changing from green to red, yellow, and brown. They would fall and rustle on the ground. Every day some of them came off. Sometimes a gust of wind would send a great many down at one time.

Near the home of Helen and Frank was a small hickory tree. It was covered with pretty yellow leaves. There was a strong wind one night, and the next day all the yellow leaves were on the ground.

One day Helen and Frank went out to gather some bright-colored leaves for mamma. They found the yellow leaves of a birch and a poplar. They had a large bunch of sumach leaves. These were red.

They brought home branches of red maple leaves. They had yellow leaves from a hickory and a few yellow leaves from a chestnut tree. Helen had a small beech twig.

Mamma thanked Helen and Frank for the leaves. She said that her children had learned a great many things about them, and now they must learn something about twigs or stems.

She gave a branch of maple to Frank and asked him to take off a leaf.

How easily it came off! He scarcely touched it, when it dropped away from the twig.

"What do you see at the place where the leaf came off?" asked mamma.

"The petiole of the leaf covered a tiny knob or lump."

"That little knob is a leaf bud. Some time we will learn about the buds on a twig."

"Look at the bark on a place that was covered by a petiole. Is it the same color as the bark on other parts of the twig?"

"No, mamma, the color is lighter, with a dark line around it."

"That light spot is called a scar. Every leaf that falls leaves a scar to mark the spot where it grew on the twig."

"Look at some of these twigs which have no leaves. Can you tell where leaves grew on them?"

"Yes," said Frank. "I see scars, that mark the spots where leaves fell off."

Helen, who was looking at a beech twig, said, "The leaves of a beech do not come off so easily as maple leaves."



NODES AND INTERNODES.

The places on a stem from which leaves grow out are called nodes.

When you know how many nodes are on a twig, you know how many leaves have grown out from that twig.

Spaces on a twig between the nodes are called internodes.

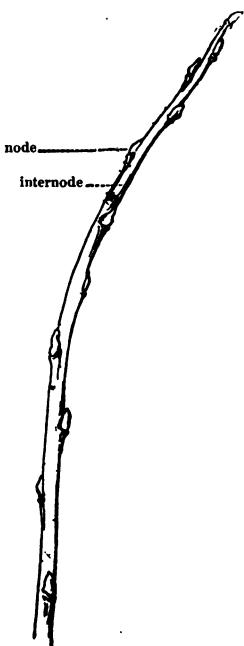
Helen measured the internodes of a long twig. She found some spaces were longer than others.

She measured around a twig. She found the internodes were not all the same size around.

Those at the base of a twig were larger than those near its apex.

Helen and Frank measured the internodes on maple and on chestnut twigs.

They found nodes and internodes on the twigs of some trees that were growing near their home.



On some of these twigs, they counted the nodes. They measured the internodes and found they were not alike.

Can you bring some twigs to the class to show nodes and internodes?

Measure the internodes.

Show some twigs on which the internodes are long.

When all the leaves had fallen from a tree, Helen could tell where they had grown last summer.

On the twigs she could see spots where the petioles came off. These spots were the scars. Just above each scar she could see a very small leaf bud.

Before a leaf fell, its petiole covered a tiny leaf bud. The leaf bud was covered so as to keep it from harm while it was very tender. Next year it will grow to be a twig.

When the warm spring days come, she may see a leaf bud growing larger and larger. Then it will open, and she may watch a growing twig.



GATHERING TWIGS.

One pleasant, sunny day in spring, mamma, Frank, and Helen went to walk in a park.

There they saw trees which had been bare all winter.

A few dead leaves were clinging to some of the branches.

"Mamma, when shall we see green leaves on these trees?" asked Frank.

"On some of the trees, you may see leaves in a few weeks. They will come from leaf buds."

"To-day, we will gather some twigs. They will help you to learn more about leaf buds."

"Frank may take a twig from this tree near the path. Do you know what kind of a tree it is?"

"I know," said Helen, "for last October I found some pretty red and yellow leaves under it. It is a maple tree."

"Here is an oak tree," said Frank, "and here are some acorns on the ground. I will get an oak twig."

"This is a hickory tree," said mamma; "Frank may gather some twigs from a hickory."

Frank breaks off some twigs. He gives them to Helen. Then he runs to an elm tree. He breaks twigs from an elm and a horse-chestnut.

"I know where there is a willow tree. The twigs grow down so near the ground that I can reach them. There are a great many twigs lying on the ground under the tree."

HOW BUDS ARE PLACED.

Frank brings home a bundle of twigs. He has taken them from maple trees and from horse-chestnut trees. Some grew on oaks and some on elms. He puts the twigs on a table.

Helen has gathered some twigs which she puts with Frank's. She has hickory, willow, and lilac twigs.

Mamma asks the children to look at all of these twigs, then tell her something about them.

"I can see buds on all the twigs," said Frank
"On some they look like little knobs. They are not
the same size, some are larger than others."

"Almost every one is cone-shaped," said Helen.
"They look like the bills of some birds. Sometimes
two buds are close together. Sometimes the
buds are alone."



"You may see leaf buds growing in two ways on a stem or twig. Sometimes they are in pairs, and sometimes they grow singly. Can you find a twig on which the buds are in pairs?"

"Yes, mamma, here is a lilac. The lilac buds are in pairs."

"Are buds on a maple twig single or in pairs?" asks mamma.

Frank cannot find a maple twig, but Helen finds one and says, "Maple buds are in pairs."

Helen and Frank look at other twigs on the table. They find only one which has its buds in pairs. This is a horse-chestnut.

Mamma tells them they may find many trees and shrubs which have their buds in pairs. When buds are in pairs, they are opposite.

Frank looks at the other twigs on the table. All have single buds; they are not opposite on the twigs.

When leaf buds are not opposite, they are alternate.

An elm has alternate leaf buds; so have an oak and a hickory.

When buds are alternate, they seem to follow after one another along the twig. They begin at different distances on the stem.

When buds are opposite, they stand base to base on a stem.

There are buds at the ends of twigs. Mamma says that these end buds are called terminal buds.

Can you find a terminal bud on some twig?

Find a twig that has opposite buds, and one that has alternate buds.



If buds on a twig are alternate, the leaves on that twig will be alternate. If buds on a stem are opposite, the leaves will be in pairs.

Are leaves on a maple tree alternate or opposite? How do they grow on an elm tree?



ABOUT BUD SCALES.

All winter the leaf buds are carefully covered. Jack Frost cannot harm them.

The cold snows and rains cannot get at the little leaves within them. Each leaf bud is closely covered with scales.

Look at the leaf bud of a hickory. See those little scales folded so tightly over it. There is no place where the rain can get in to harm the tender leaves.

The scales of a hickory bud look like velvet. In winter a hickory leaf bud wears a velvet coat. Little tender leaves are rolled up inside this velvet coat.

In spring, when days are long and bright, the little leaves grow very fast. Then they push off their velvet wraps. They do not need them when warm weather comes.



The leaves grow away from their velvet coats or scales. Very soon these scales wither and fall off. When leaves have grown large and strong, we cannot see the scales which covered them.

All leaf buds are not like those of a hickory. All do not have velvet coats to keep their young leaves warm in winter.

Some trees and plants grow where it is always warm. These have buds without scales.

Trees that grow in cold climates have leaf buds covered with scales. Scales protect the tender leaves through the winter months. When warm weather comes, they are no longer needed; then they fall off.

The scales or coats of most leaf buds have soft linings. A soft lining is next to the tender young leaves.

Some linings are smooth, like satin. Scales of other buds are lined with soft, fine hairs. Woolly linings are in some scales. Do you know why scales have such soft linings?

A bud covers its young leaves closely with scales to keep them from cold and wet. Many kinds of buds have a covering outside their scales.

Some buds have coverings like wool. Others are sticky, as if covered with a gum. Many kinds of buds are covered with something that looks like wax. Snow and rain cannot get through these coverings.

WATCHING LEAF BUDS.

Helen and Frank want to know how leaves come out of a leaf bud. A bud may be very small, but the leaves that grow from it will be large. How are large leaves kept in small buds?

There is a horse-chestnut tree near their home. Mamma tells them to watch the buds on that.

She says: "The buds are growing larger and larger every day. Very soon leaves will be on the tree. If you watch them closely for a few weeks, you will learn a great deal about them."

"Every day you must tell some new thing you have seen. I will give each a little book. In it you can write what you learn about buds and leaves."

"A horse-chestnut tree is large, and has many buds. Do not try to watch them all. You will learn a great deal more if you watch only a few."

"Look first for two or three very large buds. When you have found some of the largest on the tree, tie a white thread around the twig near them."

"Next look for some very small leaf buds. Tie a black thread around the twig near these. Do not tie the threads tightly, for that will cut the bark and harm the twig."

"These threads will help you to find the buds when

you wish to look at them. You must watch these buds to notice the changes from day to day."

The children are pleased to have mamma help them. They want to learn more about leaf buds and leaves. They take some threads and go out to tie them around twigs.

On one twig they see four very large buds. They put a white thread on this. Then they find one having six small buds. "We will tie a black thread here," said Frank.

Helen can reach a twig which has a great many buds on it. Some are large and some are small. She ties both black and white threads around this. She wants to see whether all these buds will open at the same time.

The children tie threads on a lilac bush and on a willow tree. They will watch the buds on these.

Mamma tells them they must not forget to look at every part of a bud. Every day they must look at its tip to see how it changes.

Mamina wants them to make a drawing of the same bud each day for two weeks, to write the date on each drawing, and to keep it till next summer. After leaf buds are gone, and when leaves have come, they will like to look at their drawings.

THE HORSE-CHESTNUT.

Many times in a day Helen and Frank went out to look at leaf buds on the horse-chestnut tree.

When Frank tied threads on the twigs, he found something sticky covering the buds. The lilac and willow buds were not sticky, like those on the horse-chestnut.

Day by day the buds grew and the sticky matter on them became softer. It was like a varnish.

One day Helen saw the scales on a bud had moved a little. Now the bud would open and show her what was inside.

First she saw something that looked like brown wool. The scales spread farther apart, and this brown wool came out more and more.



Then she saw it was a leaf peeping out, but it was almost hidden in its woolly wrapper. It was closely covered with a woolly wrapper, as if to keep out the cold.

When it had grown far out of the bud, and had been warmed by the sun, it began to open into parts. Then Helen saw a pretty green color.

The leaf was wrinkled. When it opened into parts, there were seven wrinkled parts. These were to make a great horse-chestnut leaf.

Frank said they were wrinkled because they had been folded away so tightly all winter.

The warm sun made the little leaves grow larger and larger each day. The spring winds soon began to shake out their wrinkles.

When the leaves first unfolded, they were very tender. One day there was a strong wind and many leaves were torn by it.

As the days became warmer, the leaves grew larger and their wrinkles came out. It was not long before they were great, spreading leaves that would remain all summer.

Their color became darker and darker every day. They did not have the same bright green as when they first unfolded.

The veins grew larger and became more woody; then the leaves were strong. These were the great leaves that make a cooling shade in hot summer days.



THE LILAC.

All the spring days, Helen and Frank were busy. They were watching the twigs on trees and shrubs.

A bright sun and warm showers made the little leaf buds grow. Lilac and willow buds grew fast.

One sunny day the scales on lilac buds began to open, so as to let out the young leaves. There were many little leaves folded up in each bud.

When the scales on a bud had opened far enough, Helen saw two little lilac leaves. Their color was not like horse-chestnut leaves. They came out without any soft wool covering.

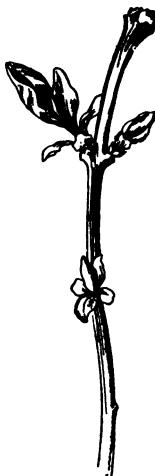
The first or outside leaves seemed to be folded around others in the bud. The out-

side leaves must spread out to make room for others to unfold.

Warm winds and a bright sun made the lilac leaves unfold. Then they grew very fast and their wrinkles came out.

The leaves grew so fast that soon they were larger than their winter home. In a few hours they were too large to be crowded back into their small winter home.

Frank said that this was the season



for a lilac bush to unfold its summer clothing and to smooth out its wrinkles.

Only a few days after Helen had seen the first buds open, the lilac bush was covered with leaves. Flower buds, too, were growing on the lilac bush. They had been wrapped up inside the leaf buds.

HOW LEAVES ARE FOLDED.

Frank and Helen like to watch leaves as they unfold. They find that all leaves are not folded in the same way. Each tree and shrub has its own way for folding or rolling its young leaves.

There are many ways
for folding or rolling leaves
in a leaf bud.

In some buds the baby leaves are rolled tightly, and Helen can see only one edge of the blade. Before the leaf unrolls it looks like a little horn.



Again, Helen finds some leaves rolled so that she can see only the under surface of the blade. On another tree or shrub she finds them rolled so that the upper surface of the blade is on the outside.

Some leaves are folded like fans. Others are folded along the midvein, and one-half the blade is placed on the other half.



Frank and Helen are very busy these spring days. Every day they write in their books. They write names of trees on which new leaves are coming out. They write how these leaves are folded or rolled.

They write about the color of leaves, and how they look when they first come out. They know how buds open on a birch and a willow; how they open on a cherry, a maple, and a tulip tree.

Frank and Helen watch some ferns unroll. When the fern leaves come up out of the cold ground, they are snugly wrapped in their blankets. Helen says each leaf makes her think of the spirals on a snail's shell.

The children make drawings of buds and leaves, and can tell a great deal about them.

Can you tell how a currant leaf unfolds?

Watch a maple or a birch when the buds are opening. See whether the leaves are rolled or folded.

Look at the opening buds on an oak, to see whether the leaves have been packed like those in the buds of apple trees.



Did you ever watch a violet leaf to see how it unrolls? Are its margins rolled inward or outward?

Frank has learned that some leaves unfold earlier than others. Some young leaves can unroll in less time than others.



PARTS OF A FLOWER.

When spring days come, the sun is warm and bright, but almost every day clouds will come to hide it. Almost every day there is a gentle shower.

The rain does not last a long time. In a little while the clouds break away, and the sun beams out as brightly as before.

Spring sunshine and spring showers put new life into all things. They make the little leaf buds swell and open.

Bright sunshine and warm rains will open another kind of buds. They will make the flower buds show their pretty colors.

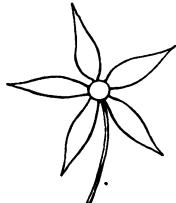
On pleasant spring days, Frank and Helen like to be out of doors. They like to watch the buds as they unfold. Every day they find something new.

A few days ago they saw the first leaves coming out on a cherry tree. Then they saw just one little blossom. Now the cherry tree is white with flowers.

Frank takes some of these flowers to his mamma. He wants to learn about them. He knows many things about leaves, now he wants to know about flowers.

Mamma tells him that flowers have different parts. If he wants to know about them, he must carefully study each part.

Frank looks at the part outside a cherry blossom, and says, "Here are five little green leaves outside some white ones. What are they called, mamma?"



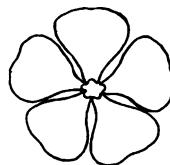
"These are the five sepals of the flower ; all together they are called the calyx.

"The calyx of a flower is the outside circle of leaves. The word calyx means cup.

"When you see a flower, look for its calyx."

Frank finds a circle of white leaves next inside the calyx, or circle of green leaves.

There are five of these white leaves. They are called petals. All together they look like a round white dish.



These white petals are not quite smooth. Each has a wrinkle in it. The petals are not so thick as the sepals ; they are thin and soft.

These white petals are the corolla of a cherry blossom. The corolla of a flower may be red, yellow, or blue. The corolla of a cherry blossom is white.

The thin leaves which are within a calyx make the corolla of a flower.

Next to the corolla are many little parts. These look like short threads with yellow tops.



In a cherry flower there are a great many of these short threads. They are called stamens.

Stamens are slender, thread-like parts next inside the corolla.

 In the middle of a cherry blossom is a larger thread. It does not have a yellow top, like the stamens. This is a pistil.

The pistil is in the middle of a flower.

The parts of a flower are calyx, corolla, stamens, and pistil.



THE CHERRY BLOSSOM.

Little cherry blossom
Lived up in a tree,
And a very pretty
 Little thing was she;
Clad all through the winter
 In a coat of brown,
Warm she was though living
 In a northern town.

But one sunny morning,
Thinking it was May,
“I’ll not wear,” said blossom,
 “This brown dress to-day.”
So she let her brown dress
 Drop and blow away,
Putting on a white one,
 That fine sunny day.

ANONYMOUS.



THE CALYX.

The outside circle of green leaves is the calyx of a flower, or its flower cup. Like a cup it holds the tender flower when in bud.

The calyx of a cherry blossom has five leaf-like parts. These are called sepals.

Look at many kinds of flowers to see whether their sepals are like those of a cherry blossom.

When we want to know whether leaves are alike, we look at their colors and shapes. We look at their veinings and their bases. We see whether the apex of one is like that of another.

We must look at sepals in the same way. We must notice all these things, because sepals are very much like true leaves.

The apex of each sepal in a cherry blossom is a sharp point. Sometimes these fine points are rolled backward towards the stem of the flower. When the white parts of the flower fall off, the sepals will turn brown.

In some flowers the sepals are separate, as in a cherry blossom. Then one can be pulled off without disturbing another. In other flowers, like a scarlet catchfly, the sepals grow together.

In the blossom of a pink you will see the sepals grown together. Each sepal has a pointed apex. Together these make five points or teeth on the top of the flower cup. We call it a five-toothed calyx.

Perhaps each sepal of a calyx has a rounded apex. If these grow together their entire length, the edge of the calyx is crenate. You know what crenate means.

The teeth or parts in the edge of a calyx show



how many sepals have grown together. Where five sepals are joined, the calyx is five-parted. If only four sepals are joined, it is a four-parted calyx.

If sepals have grown together, a whole calyx may be taken off at one time. The whole calyx of a sage blossom may be taken off at once. Try to find other flowers whose calyx may be taken off like this.



The sepals of a flower are not always the same length. They are not always the same size. One may be larger or smaller than another. Then we say the calyx is not regular.

Did you ever see a flower without a calyx? You have seen the buds on a poppy. You did not see the bright red petals because they were inside a green calyx. When the bud opened into a flower, the green sepals fell off; then the flower had no calyx. Do you know another flower which loses its calyx as soon as it opens?



THE COROLLA.

The flower of a cherry has a white corolla. Each part is called a petal.

Take off one petal to see its shape. Petals have two parts, a limb and a claw. The



limbs of most petals are not so thick as the claws.

When we look at petals of different flowers we find the limbs are not alike. Some limbs have entire margins, like the petals of a buttercup or a rose. Sometimes the limbs of petals have toothed margins, like those of a pink. Others are fringed like a ragged-robin or fringed gentian.

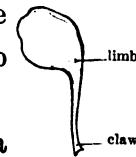
Wavy margins, crenate margins, and lobed margins are found on petals as well as leaves.

We have seen chickweed growing in our gardens, or by the roadside, or spreading over waste ground. It grows in almost any place. We have even seen it between bricks on a sidewalk.

Its bright green leaves will tempt us to gather some. Then we can see its pretty white blossom. Its petals are cut or cleft. Do you think it has ten petals? It has only five, but they are cut or cleft so deeply that each petal looks like two.

There is another weed which has white, two-cleft petals. It is the bladder-campion. This weed is common in New England. There the children call it "snappers," because, when they strike the calyx on their hands, it bursts with a sharp sound.

A claw is the lower part of a petal. In a rose or a buttercup the claws are short. In some flowers the claws of petals are long. Look at a blos-



som from a wild mustard, a sweet rocket, or a pink. The petals of these blossoms have long claws.

What kind of claws do you see in a nasturtium? Are they short, or are they long?

Petals are almost always some other color than green. A buttercup has yellow petals, and those of a harebell are blue. You can think of many flowers that have pink, red, or purple petals.

Sometimes petals are as thick as the sepals of a flower. Not many petals are as thick as the green leaves of the plant on which they grow.



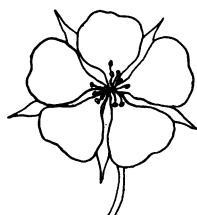
KINDS OF COROLLA.

A wild rose has five petals. These have broad limbs and short claws. They spread out like the sepals.

They do not grow so as to cover the sepals, but they cover the spaces between them.

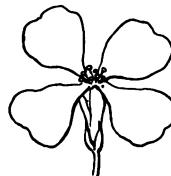
Take a flower from an apple tree, a peach tree, or a cherry tree. The petals are placed like the petals of a rose.

The flowers of a strawberry, a blackberry, or a raspberry have petals growing in the same way. There are a great many flowers having corollas shaped like a rose.



Another kind of corolla is in the shape of a cross. Look at a flower from a wild mustard or from a sweet rocket. Each blossom has four petals.

The petals of these flowers have long claws and spreading limbs. They are placed so as to form a cross. What other flower has a corolla shaped like a cross?



Pinks have petals with long claws, but they do not form a cross. A double pink has a great many petals. A single pink has only five petals. These are set in a long calyx tube, and are spreading at the top.

We often find a purple flower in corn-fields. It is the corn cockle. Farmers do not like it; they call it a troublesome weed. Its corolla has five petals, and they are placed like those of a pink.

You can find other flowers whose petals are placed like those of a pink.

The corolla of a sweet pea has five petals. They are not alike in shape or size.

These petals have names. The upper one is the

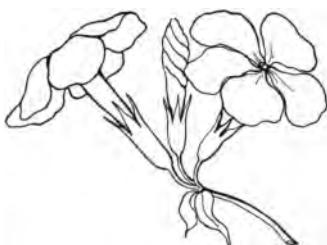


largest. It is called the standard or the banner. The two side petals are the wings. You find the two lower petals are partly joined; these are called the keel.

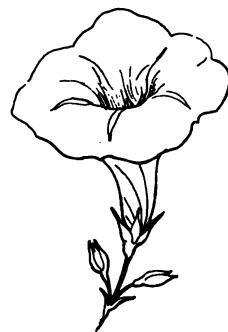
A corolla like this is not regular. Flowers of a locust, a bean, a pea, or a Wistaria are called irregular.

You have seen flowers whose sepals had grown together. You can also find those having petals grown together. Then a corolla is in one piece, instead of being in parts. You know how a bluebell looks with its five-cleft or five-toothed bell. Its corolla is in one piece.

The corolla of a morning-glory is in one piece. It looks as if the claws of the petals had grown together, to make a tube. The limb or border opens like a funnel. The corolla is funnel-form. What other flower have you seen that is shaped like this?



corolla of a phlox is salver-form.

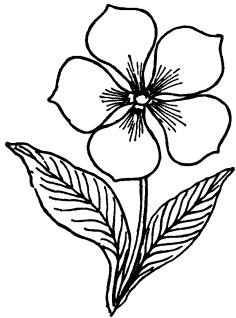


At the top of a slender tube, the limbs of petals may bend to make a flat, spreading border. A corolla of this kind is salver-form. The

Spreading borders sometimes have deep cuts in them. The corolla of a lilac is salver-form, with four deep cuts in the border. It is a four-parted border.

You may think the corolla of a lilac has four petals, but if you try to pull one out they will all come off together. All the petals are united, making a slender tube below the border.

Another flower which is salver-form is the periwinkle. It grows on a trailing plant that has evergreen leaves. Its bright blue flowers open early in the spring.



When a border does not spread out, or when the limbs are short, the flower is tubular, or like a tube.

THE PERIANTH.

Sometimes we may want to speak of all the flower leaves of a blossom. Then we say the perianth of a flower. The sepals and petals together make a perianth.

A yellow buttercup or a blue harebell has a green calyx. Do you think the calyx of a flower is always green? Not always; a flower may have a calyx that is colored like its corolla. When a calyx and a corolla are nearly alike, the word perianth is used for both.

A Japan lily in our garden, or a yellow lily in the fields, has no green calyx. Have you ever seen a lily bud just starting to grow? Perhaps it had a greenish color at first, but before the flower opened the green color was gone.

You have seen buds on a tiger lily. Their outside leaves are a dull orange color. Watch them as they unfold, and you will find other leaves within.

The three colored leaves on the outside make the calyx. There are three colored leaves within to make the corolla. These six colored leaves make a perianth.

A tiger lily has a six-parted perianth. Look at the inside of the perianth. Both sepals and petals are marked with black or dark brown spots. They roll backward as if to show their beauty. The perianth opens to the sunshine and light.

Summer is the season for lilies. A few will come in the spring, but most of them blossom in summer. They may be found on hills, in fields, and in meadows. Some have bright-colored perianths, that can be seen a great way off.

Frank found a pretty red lily. It was growing among sweet-fern and blueberry bushes. Its orange-red perianth was spotted at the base. It looked like a bell standing on its handle.

Another pretty lily grows in meadows. Frank found one where some men were cutting meadow grass. Its pretty yellow flowers were shaped like bells. Inside they were spotted with dark red. This plant did not hold its bells up, like the red lily. They were hanging from the top of a tall stem. One stem had five bells hanging from its top.

Another hanging lily is white. You have seen it growing in gardens. Its perianth is shaped more like a trumpet than like a bell. Have you seen the ridges on both sepals and petals? Are the sepals and petals shaped alike? Look at other lilies to see the shape of their perianths.

Some early spring flowers have pretty colored perianths. Where you see a colored bud, you may expect to see a colored perianth after it opens.

LILIES.

In my garden there are lilies,
 Lilies swinging to and fro,
Garden lilies, rosy lilies,
 Lilies white as drifting snow.

Here the blazing tiger lily,
 There the evening lily pale;
And in the corners, dark and shady,
 Little lilies of the vale.

In my garden there are lilies;
 And the wild bees come and go,
Seeking honey from my lilies
 Swinging slowly to and fro.

— ETHEL CLIFFORD.



STAMENS.

Within the perianth of a flower you can find its stamens. Their little threads are often white, but sometimes they are colored.

In some flowers the threads of stamens are coarse. In other flowers they are very fine; they are almost as fine as hairs.

You will find that all flowers do not have the same number of stamens. In a lilac blossom there are two stamens. Some flowers have four stamens. You will find six stamens in a tulip.

When you look at the stamens in a wild rose or a buttercup, you find a great many.

There seems to be a little head on the top of each thread. If you look at these heads in different flowers, you will find large heads, small heads, flat heads, long heads, and round heads.

These heads are called anthers. They are on the tops of the thread-like parts. Some stamens have yellow anthers. Others have brown, purple, red, or white anthers.

You have seen a flower which has brown anthers. These brown anthers are shaped like boats. Can you think of a flower that has long anthers?



You know a flower that has yellow anthers, and another flower which has white anthers. What are the names of these flowers?

After a flower has been opened a while there is a kind of dust on its anthers. This dust is fine, like flour. It is pollen.

If you touch the anthers of a flower that has been opened a short time, the pollen comes off easily. Pollen often falls on petals where it can be seen. There it looks like a brown, white, or yellow dust.

After pollen falls from the anthers, a flower begins to fade. Some time you will learn the use of pollen.

Stamens are not all alike. We find both long and short stamens. Even in the same flower, some stamens will be short and some will be long.

Did you ever see a flower in which there were both long and short stamens? Take the petals from the flower of a wild mustard. There you will see four long stamens and two short ones. Look at the little white alyssum that is found in gardens. What kind of stamens do you find?

Sometimes we find flowers having very long stamens. They will reach out far beyond the border of the corolla.

In July the swamp pink or swamp honeysuckle opens its fragrant flowers. Then we can see the long stamens beyond its corolla.

Some tubular flowers have stamens reaching out beyond the tube. Other tubular flowers have their stamens hidden in the tube.

In some flowers, the stamens look as if they were bent or broken. In others they are twisted. Some flowers have flat stamens.

The Deutzia is a common shrub in our gardens. A Deutzia has white flowers shaped like bells. If you look at one of the stamens, you will see it is flattened. On its top there are three points. A golden anther is on the middle point.

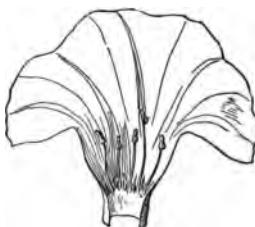
MORE ABOUT STAMENS.

If you look at many flowers you may find three things about stamens.

You may find them growing from a corolla. They may be growing from a calyx. They may be free from both corolla and calyx.

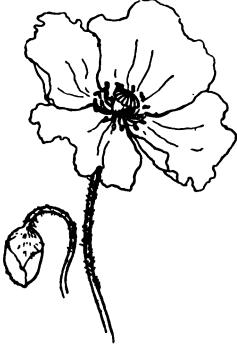
A phlox and a morning-glory have stamens joined to the tube of a funnel, and growing from it. When a corolla is taken from a flower of this kind, stamens come off with it. The stamens grow from the corolla.

Again, stamens may join a calyx and grow from it. Stamens of a rose are fastened to the calyx of a flower. Look at a blossom from an apple tree, to see



whether the stamens are fastened to its calyx or to its corolla.

In many flowers the stamens do not grow to a calyx or to a corolla. They are free from these parts of the blossom. The single red poppy loses its calyx when the flower opens. Its corolla may then be taken off, and the stamens will remain. They are free from both calyx and corolla. Stamens in a wild mandrake or May-apple do not grow to calyx or corolla.



You have found flowers having their sepals grown together, and flowers whose petals grew together. There are some flowers in which the stamens grow together. Perhaps you may find all the stamens growing in one bundle, as they grow in a hollyhock.

Did you ever gather the young, green seeds of a plant and call them "cheeses"? These seeds grow on plants called mallows.

Look at a flower from a mallow to see how its stamens grow. Break all the stamens from a flower and look at the base. The stamens have grown together to make a tube. In the tube is a pistil.

Have you seen the blossom of a cotton plant? Its stamens are grown together like these.

There are flowers which have their stamens in two sets. The blossom of a sweet pea has ten stamens. Nine of them grow in one bundle or set, and there is one stamen alone.

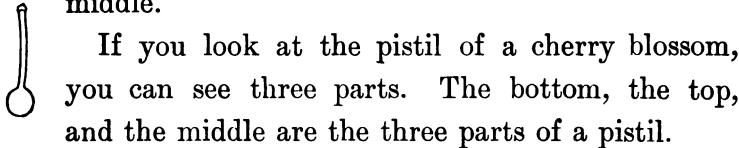
Stamens grow in this way in the flowers of a locust, or in the golden blossoms of a laburnum.

When you are looking at flowers, be sure to notice their stamens, and tell what you know about them.



THE PISTIL.

In the middle of a flower you may find the pistil. It is larger at the bottom and the top than it is in the middle.



If you look at the pistil of a cherry blossom, you can see three parts. The bottom, the top, and the middle are the three parts of a pistil.

Look at the pistil in a peach blossom to find its three parts. Perhaps you may not easily find three parts of a pistil in every flower.

All pistils do not look alike. The pistil of a spring-beauty is three-parted at the top.



The ovary is the bottom part of a pistil. The stigma is the top part of a pistil. The style is the middle part between the ovary and stigma.

The style is like a stem of the stigma. Some stigmas have long styles and others have very short styles, just as flowers have long or short stems.

When a stigma has no style, it must sit on the ovary. Then we say the stigma is sessile.

Look at a tulip blossom. You can see a three-cornered ovary. The stigma is three-parted. Where is the style? Is the stigma in a tulip sessile?

Pollen will fall from the anthers of a flower. It will work its way down through the stigma and style into the ovary.

When the petals of a flower are old and withered, they fall off. The ovary is left on the flower stalk, and keeps on growing. Young seeds are in it.

The ovary must stay on a flower stalk until the seeds are ripened.

Perhaps you may find two, or three, or more pistils in the middle of some flowers. You will know the pistils from the stamens, because they do not have anthers and pollen.

In a cherry blossom there is one pistil. In a buttercup there are a great many pistils. They are very small, and are packed closely together. There is a little ovary at the base of each pistil. You do not see a style, because the stigma is sessile.

When you have studied many, many flowers, you *will learn other things* about stamens and pistils.



FLOWER TIME.

The bluebell with its soft green leaves,
Looks out upon the sky;
The violet in her shady nook,
Opens her soft blue eye.

The daisy and the buttercup
Are blooming everywhere;
A thousand pretty woodland flowers,
With fragrance fill the air.

The merry, happy children dance
Beneath the shady trees,
As happy as the little birds
And busy as the bees.

— ANON.



STEMS OF FLOWERS.

Helen and Frank like to go out in the fields to look for violets. They often find them growing in grassy spots by the roadside.

Sometimes there will be a great many growing close together. Each violet grows on a stem. The stem of a flower is called its peduncle.

Peduncles are not the same length. One flower may have a short peduncle. The stem or peduncle of another flower may be very long.

Helen never finds more than one violet growing on a stem. She may find many flowers which grow alone on a peduncle.

All flowers do not grow this way. Some kinds seem to like company, and a great many will grow on one peduncle. Then each blossom may be on a short stem that branches out from the peduncle.

A short stem that branches out from the peduncle is called a pedicel. A pedicel is almost always smaller than a peduncle.

Each little bell or flower on a lily of the valley has a short stem. Each little bell grows on a pedicel. The pedicels join the peduncle.

Helen sees the flowers on mamma's geranium. Each

is on a pedicel. A great many pedicels grow from the large peduncle.

Frank thinks the flowers that grow on locust trees, or on a mountain ash, are on pedicels. What flowers have you seen growing on pedicels?

You know what sessile leaves are. Sessile means sitting. Flowers as well as leaves may be sessile. They may seem to sit on a twig, or on the main stalk of a plant.

If flowers have no stems, and grow to the main stalk of a plant, they are sessile. A mullein has sessile flowers.

On a hollyhock you may find sessile flowers. Now and then, hollyhock flowers are on short stems; we say these flowers are nearly sessile. Have you ever seen a balsam growing in a garden? Are its flowers sessile, or are they nearly sessile?

Flowers may grow on a plant in three ways. They may be sessile, or growing to the main stalk of a plant. They may grow on pedicels. There may be a single flower on a peduncle.

When a peduncle has only one blossom, the flower is solitary. A common red poppy is a solitary flower. Only one blossom is on a peduncle.

If there are many flowers growing from one peduncle, they are called a cluster.

KINDS OF CLUSTERS.

Clusters are made of several flowers growing from one peduncle. There are many kinds of clusters.

One kind of cluster is called a raceme. The raceme has many little flowers. Each is on a pedicel that joins a peduncle. All the pedicels are nearly the same length.

One day in early spring Frank went to the woods. Here he saw a small tree covered with white blossoms. The flowers were in racemes.

Last summer Frank came to this tree and found some nice fruit on it. It was the wild service-berry. This small tree is also called June-berry and shad-flower.



In the flower garden Helen found some low plants. Some had blue flowers growing on them, and some had white flowers. Each little blossom had a yellow eye in its centre.

These flowers were growing in short racemes. Helen called them forget-me-nots.

Mamma picked the smallest green leaf from one of these plants. She showed the fine, short hairs grow-

ing on it. She said the tiny leaf was shaped like the ear of a mouse.

Little flowers that do not have pedicels, but grow close to a stem, form a spike. The flowers on a spike are sessile.

Frank finds some pale purple flowers growing in spikes. He finds them in meadows and in damp places in the woods. Their corollas are fringed. They grow along a stem and have no pedicel. They are the purple fringed orchis, growing in spikes.

You know flowers in a raceme grow on pedicels. These pedicels grow out along a stem, and are nearly the same length. Other flowers may grow on pedicels of the same length, and yet the cluster is not a raceme.

Instead of growing along a stem, all the pedicels may grow from the same place. They may start from the top of a peduncle, and have nearly the same length.

Almost everybody has seen scarlet geraniums. In warm weather they grow out of doors.

When winter comes people have them in houses. Look at a cluster of their bright red flowers.



In a cluster from a geranium each single flower is on a pedicel. The pedicels are nearly the same length. All grow from the top of a peduncle.

Clusters of flowers growing like these are called umbels. When pedicels all start from about the same place, and are nearly the same length, the cluster is an umbel.

Pedicels often grow along a stem as in a raceme, yet they are not all the same length. This makes another kind of cluster.

There are some flowers whose pedicels grow along a stem, and the lower pedicels are longer than the upper ones. These flowers make clusters called corymbs.

Among mamma's flowers Helen found a white candytuft or Iberis. Each little flower had four white petals. The petals were not alike; two were large and two

were small. The petals had long claws and spreading limbs. They were placed so as to form a cross.

Each flower of the candytuft grew on a pedicel. The pedicels grew along a stem but were not the same length. The cluster was a corymb.

A pretty evergreen shrub grows in the woods. Its alternate leaves are very smooth. Do you know the name of this evergreen shrub? It is a mountain laurel.



It has beautiful corymbs of red, pink, or white flowers. The corolla of each is in one piece. Inside a corolla are ten little pits or hollows. When a flower first opens, you may see an anther in each pit. Put a pin under the thread of a stamen and lift it gently. This seems to awaken the anther, for it jumps out of the pit.

Lambkill, or sheep-poison, has corollas like those of a mountain laurel. Look at its blossoms. You may find many in which the stamens have come out of the pits. When they jumped out they threw off some pollen.

We may find other kinds of flower clusters. The different kinds have names. You may learn some of the names now. You will learn more at another time.

SPRING.

In a green meadow
The brook ripples clear;
Soft, in the sunshine,
The daisies appear.

See how the dandelions
Brightly unfold;
They hide, in the shining grass,
Yellow as gold.

Blow, gentle breeze,
On the hill and the plain;
Play in the sunshine,
And blow off the rain.

— *Pictures and Rhymes.*

WILD FLOWERS.

Frank likes to gather wild flowers. He knows a place where he can find a great many. It is near a little stream of water.

Not far away from this stream is a hill, where oak, chestnut, and beech trees are growing. Wild grape-vines and brambles are growing on the hill. Here and there is a small pine tree.

In spring Frank comes to this place to look for hepaticas and bloodroot. Sometimes he finds a yellow violet or a spring-beauty. There is a sunny spot where pretty bluets are growing amongst the grass.

Between dried leaves, he sees anemones peeping up.



Their delicate white blossoms look like stars. Frank calls them wind-flowers. Some people think this flower spreads its petals more in windy weather than at any other time. Frank thinks anemones like to grow where the wind will blow them about.

Near where the anemones grow, Frank finds some pretty bluets. They grow on a sunny slope of the hill. Many of these small blue flowers are growing

close together. The hillside is almost as blue as the sky above it.

The flowers are small, but they have more names than any of their larger neighbors. A tiny flower has the long name Houstonia. Fairy flax is another name given to it. Surely, it looks delicate enough for a fairy to handle.

It is also known as Venus's-pride and innocence. If you live near Philadelphia you have heard it called Quaker bonnet and Quaker lady. It has been called a blue treasure; but all Houstonias cannot have this name, because some blossoms are white.

Near the brook, a spring-beauty is sometimes found. Its dainty, pink corolla is half hidden in the grass. Its petals of pale pink are marked with fine red or purple lines. More than one flower grows from a peduncle. Its long, narrow leaves are opposite.

Frank must go out in the forenoon if he wants to find a spring-beauty looking up at him. In the afternoon these flowers are sleepy, then they drop their heads.

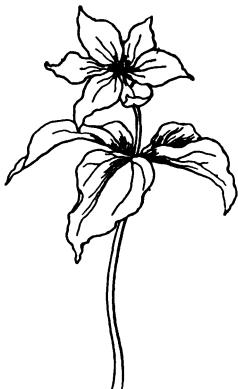
In a piece of cool, damp woods, Frank finds a trillium



or wake-robin. It is shaded by the young leaves of birch, of ash, and of maple trees.

This flower is called wake-robin, because people think it blossoms when robins come in the spring. But sometimes we may see robins many days before we can find a flower.

The blossom, with its three white petals, looks like a large snowflake that has fallen on a tall flower stem.



There are three green leaves growing near the top of the peduncle. Each leaf has three veins and many veinlets. It is a net-veined leaf.

Above these three leaves is the flower. There is only one blossom on a stem. It is a solitary flower.

The white petals have wavy margins. At the base of each petal are fine, purple lines. This is a painted trillium.

There are other kinds of trilliums. They have dark red, purple, pale pink, or cream-colored petals. These flowers have many names. One kind is called bath flower. There is a drooping trillium, and a nodding trillium. One kind is called a Benjamin flower and a squaw-flower.

Trilliums have all their parts in threes. There are

always three green leaves near the top of the peduncle and just below the flower. There are three sepals and three petals. Two threes or six stamens are within the corolla, and a three-parted pistil is in the middle of the flower.

When the hot days of summer come, we do not see the pretty flowers of the trilliums. Instead of a flower, there is a fruit. In September there will be a purple or a red berry on the peduncle.

THE VIOLET.

Dear little violet,
 Don't be afraid,
Lift your blue eyes
 From the rock's mossy shade.
All the birds call for you,
 Out of the sky ;
May is here waiting,
 And here, too, am I.

Why do you shiver so,
 Violet sweet ?
Soft is the meadow grass
 Under my feet.
Wrapped in your hood of green,
 Violet, why
Peep from your earth door
 So silent and shy ?

— LUCY LARCOM.

Did you ever see a little scale on the petal of a buttercup? Take off a petal and look at its base. The claw is nearly covered with a scale.

There are many stamens in a buttercup. Their anthers are nearly as long as the threads to which they are fastened. Crowded together in the middle of a flower are many pistils. They are yellow like the stamens. They grow together so closely that they appear like a little ball.

Summer is the season for roses. Garden roses and wild roses fill the air with perfume.

Both wild roses and buttercups have spreading corollas. From any one of these blossoms we can take off the petals and leave the rest of a flower. From a buttercup we can take off the sepals, also, and leave the rest of a flower. We cannot do this with a rose. When the sepals are taken off a rose, the stamens come off with them. In a rose, sepals and stamens grow together.

We shall see many geraniums in summer. Their flowers grow in clusters. What kind of clusters do they form?

When you have a cluster of geraniums, find the parts of a flower. See whether each stamen has an anther. Sometimes you will find a thread without an anther.

Pansies will blossom in summer if they are in a cool place. They like to grow where there is shade part of the day. Are the petals of a pansy alike in size and shape? Is the pansy a regular flower? Look at its stamens to see how they grow close by the pistil. Look at the stem of a flower to see whether it is round.



THE BUTTERCUP.

Buttercup! Buttercup!
Hold your shining clusters up!
In each little house of gold,
What is it that I behold?
Many soldiers straight and slim,
Golden-helmeted and prim;
All day long so still they stand,
Never turning head or hand.

No one guesses where they stray
In the moonlight nights of May.
When the fairies are abroad
These small men keep watch and ward.
Round the fairy ring they pace
All night long, to guard the place;
But when morning comes again,
Back are all the little men.

— *St. Nicholas.*



LATER FLOWERS.

June is called the month of flowers, but flowers are with us after this month has passed.

After the long June days there is a season for later flowers. A few of these will last till chilly autumn comes. Some flowers which first show themselves in the hot days of July and August will last till the cold days of autumn. Some flowers do not unfold their beauties till September and October.

The beautiful gladiolus is seen in August and September. Its long, green leaves are shaped like swords. It is often called a sword-lily. Another name for it is the corn-flag. Red, yellow, pink, or white perianths grow close to a tall stem. Its cluster of flowers is a spike.

Another pretty blossom is the cardinal-flower. In July, August,

and September it is showing its pretty corolla. Even in October it may be seen in some places. Its gay, scarlet flowers grow along tall stems. The clusters look like spikes; but they are racemes, because each blossom has a short pedicel.

Cardinal-flowers like to grow in meadows or along the edges of ponds and streams. They will grow close down to the water, as if they liked to have it wash their stems. Sometimes there will be, in the pond or stream, a small piece of earth with water all around it. Two or three cardinals may be found growing on this little island.

Another name for this pretty flower is scarlet lobelia. We may find some lobelias that are not scarlet. They may be blue or white, and grow on the edges of streams like the cardinal-flower.

Toad-flax, or butter-and-eggs, is another pretty wild flower. It may be found from June till late September. It grows in pastures, by roadsides, and in waste places. It likes the sunshine. We may often find a great many growing close together in some sunny place.

Its bright orange and yellow corolla is in one piece. Its shape is not regular. When the sides of a corolla



are pressed, it opens like a mouth. Inside are stamens and pistil.

Below the flowers and growing along the stem are alternate leaves. These are narrow, and are between one and two inches long. Their odor is not pleasant.

The nasturtium is one of the summer flowers which may be seen in autumn. Its showy red, orange, or yellow blossoms are as pretty in October

as they were in July.



Look at the upper sepal of a nasturtium. It has a long spur growing backwards. There is a spur on the corolla of a toad-flax. A larkspur and a columbine have spurs. Flowers having spurs are not regular.

The smooth, roundish leaf of a nasturtium has a long petiole. When this is broken, a thin, watery juice comes out. The juice has a sharp taste, like mustard. Sometimes the long petioles twine or wind about a stick or a string. They will also wind about each other.

Autumn brings asters, goldenrod, and chrysanthemums. These flowers are rich in color and beautiful in form. They are with us in the golden days of October. They stay till Jack Frost touches them with his icy fingers. They stay till the cold storms and north winds tell them that winter is coming.

SEPTEMBER,

The goldenrod is yellow;
The corn is turning brown;
The trees, in apple orchards,
With fruit are bending down.

The gentian's bluest fringes
Are curling in the sun;
In dusty pods the milkweed
Its hidden silk has spun.

The sedges flaunt their harvest
In every meadow nook;
And asters by the brook-side
Make asters in the brook.

From dewy lanes at morning,
The grapes' sweet odors rise;
At noon the roads all flutter
With yellow butterflies.

— H. H.

NATURE READERS:

Sea-Side and Way-Side.

WRIGHT.

"Children are born Naturalists."

AGASSIZ.

"There's never a leaf or blade too mean
To be some happy creature's palace."

JAMES RUSSELL LOWELL.

THEY are the first readers ever modeled wholly on the plan of making the thought primary, the word secondary. Every child is a born naturalist—he loves nature with an ardent, spontaneous love. This WONDERFUL series directs and leads this spontaneity, and the words and sentences are learned with a surprising ease. We have tried the books in our primary schools, and can cordially recommend them to all teachers of little ones. Col. Francis W. Parker, *Cook Co. Normal School, Normal Park, Ill.*

D. C. HEATH & CO., Publishers,

BOSTON, NEW YORK AND CHICAGO.

SEASIDE AND WAYSIDE.

BOOK I.



Illustration from No. 1. — MR. AND MRS. CRAB.

CONTENTS.

LESSON.

- I. Mr. and Mrs. Crab.
- II. Mr. Crab and his House.
- III. More about Mr. Crab.
- IV. Mr. and Mrs. Crab get New Coats.
- V. What the Crab does.
- VI. Mr. Crab and his Friends.
- VII. Some Other Crabs.
- VIII. The Hermit Crab.
- IX. The Crab's Enemies.
- X. The Uses of Crabs.
- XI. Mrs. Wasp and her Home.
- XII. What Mrs. Wasp can do.
- XIII. A Look at Mrs. Wasp.
- XIV. Mrs. Wasp's Year.
- XV. Mrs. Wasp at Home.
- XVI. Review.
- XVII. The Bee and the Man.
- XVIII. How the Bee is Made
- XIX. The Bee at Home.
- XX. The Bee Babies.

LESSON.

- XXI. The Bee War.
- XXII. The Bee's Work.
- XXIII. The Wise Bees.
- XXIV. Earth Bees.
- XXV. Other Bees.
- XXVI. More about Bees.
- XXVII. The Spider and his Dress.
- XXVIII. The Spider at Home.
- XXIX. The Little Nest.
- XXX. The Spider and his Food.
- XXXI. Very Queer Spiders.
- XXXII. Review.
- XXXIII. Out of Harm's Way.
- XXXIV. Shell-Fish.
- XXXV. The Story of Mr. Conch.
- XXXVI. Sea-Babies.
- XXXVII. More about Sea-Babies.
- XXXVIII. About Mr. Drill.
- XXXIX. The Story of a War.
- XL. How Shell-Fish Feed.
- XLI. Review.

Book I. 95 pages. 32 illustrations. Introduction price, 25 cts.

BOOK . IL



Illustration from No. 2.—THE PARASOL ANTS.

CONTENTS.

LESSON.

- I. A Look at an Ant.
- II. The Life of an Ant.
- III. The Ant's Home.
- IV. The Ants at Home.
- V. The Ants on a Trip.
- VI. The Farmer Ants.
- VII. Ants and their Trades.
- VIII. The Slave Ants.
- IX. Wonder Ants.
- X. The Ways of Ants.
- XI. Mr. Worm and his Family.
- XII. The Earth-worm at Home.
- XIII. Mr. Worm at Work.
- XIV. Mr. Worm's Cottage by the Sea.
- XV. Mr. Worm at Home.
- XVI. A Look at a House-Fly
- XVII. How to Look at a Fly.
- XVIII. Mrs. Fly and her Foes.
- XIX. Of what Use are Flies.
- XX. A Swarm of Flies.
- XXI. Some Queer Flies.
- XXII. In Armor Clad.
- XXIII. When Mr. Beetle was Young.
- XXIV. How to Learn about Beetles.

LESSON.

- XXV. The Rose Beetle.
 - XXVI. Princes and Giants.
 - XXVII. The Little Sexton.
 - XXVIII. The Story of the Stag Beetle.
 - XXIX. Mr. Beetle Seeks for a Home.
 - XXX. The Little Water-Men.
 - XXXI. Whirligig Beetles.
 - XXXII. What a Fisherman Told.
 - XXXIII. Mr. Barnacle and his Son.
 - XXXIV. A Fishing Party.
 - XXXV. A Last Look at Mr. Barnacle.
 - XXXVI. Flowers of the Sea.
 - XXXVII. The Life of a Jelly-Fish.
 - XXXVIII. Sea-Stars.
 - XXXIX. A Sea-Change.
 - XL. The Star-Fish with an Over-coat.
 - XLI. The Flying Flowers.
 - XLII. Under the Water.
 - XLIII. A Happy Change.
 - XLIV. The Dragon-Fly and his Cousins.
 - XLV. The Wings of the Dragon.
- Review Lessons.

BOOK II. 184 pages. 39 illustrations. 35 cts.

BOOK III.

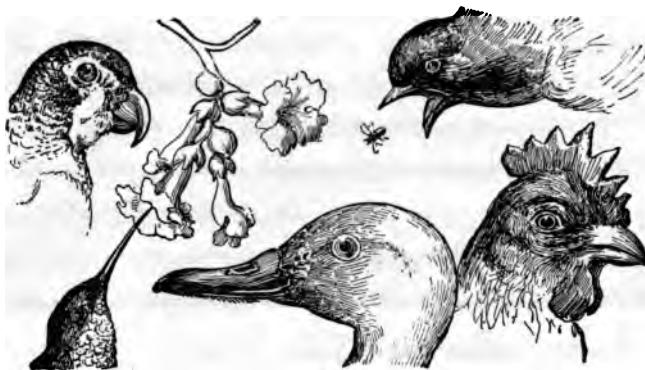


Illustration from No. 3. — BEAKS.

CONTENTS.

LESSON.

- I. The Great Mother.
- II. The Earth's Eldest Child.
- III. A Look at a Plant.
- IV. A Year in a Plant's Life.
- V. The Growth of Plants.
- VI. The Food of Plants.
- VII. Seeds and Leaves.
- VIII. The Color of Plants.
- IX. The Motion of Plants.
- X. Plants and their Partners.
- XI. Air, Water, and Sand Plants.
- XXII. Plants that eat Animals.
- XIII. Weather Prophet Plants.
- XIV. Plant Clocks.
- XV. The School Cabinet.
- XVI. The Old Man of the Meadow.
- XVII. The Life of the Old Man.
- XVIII. The Robber Cousin.
- XIX. The Merry Cousins.
- XX. Queer Cricket.
- XIX. Other Hoppers.
- XXII. A Real Live Fairy.
- XXIII. The Child of the Day.
- XXIV. Life Among Snow and Roses.

LESSON.

- XXV. Joseph's Coat.
- XXVI. Cousin Moth.
- XXVII. The Child of the Night.
- XXVIII. The Bird.
- XXIX. Beaks and Claws.
- XXX. Trees, Ground, and Water Birds.
- XXXI. On the Wing.
- XXXII. Nest Building.
- XXXIII. The Bird at Home.
- XXXIV. Birds of Song.
- XXXV. The Other Partner.
- XXXVI. A Brigade of Birds.
- XXXVII. The Birds in the Woods.
- XXXVIII. The Birds in the House.
- XXXIX. The Lost Birds.
- XL. The Fin Family.
- XLI. Outside and Inside.
- XLII. Where they live.
- XLIII. How they Behave.
- XLIV. Fry and School.
- XLV. Scales and Teeth.
- XLVI. Big and Little Brothers.

BOOK III. 300 pages. 29 illustrations. 50 cts.

BOOK IV.



Illustration from No. 4.—THE REIGN OF THE PINE.

CONTENTS.

- | | |
|------------------------------------|---|
| I. Earth Building. | XXVII. With a Duck's Bill. |
| II. The First Continent. | XXVIII. In Australian Rivers. |
| III. The Age of Crabs and Corals. | XXIX. A Walk Among Wonder Trees. |
| IV. The Pines and the Reptiles. | XXX. Still in the Wonder Grove. |
| V. The Palm and the Man. | XXXI. A Noisy Family. |
| VI. The Starry Heavens. | XXXII. The Frogs' Cousin. |
| VII. A Fragment of the Milky Way. | XXXIII. Salamanders. |
| VIII. Plan and Progression. | XXXIV. A Citizen of the Marsh Lands. |
| IX. The King of the Day. | XXXV. A Stranger from Mexico. |
| X. The Queen of the Night. | XXXVI. Some Merry Little Friends. |
| XI. Vanished Fauna. | XXXVII. The Ancient Monster. |
| XII. A Mountain of Fossils. | XXXVIII. El Lagarto. |
| XIII. Written in Rocks. | XXXIX. Wiser than any Beast of the Field. |
| XIV. Footprints in the Sand. | XL. Our Common Enemy. |
| XV. The Winter of the World. | XLI. With a House on His Back. |
| XVI. Fossil Crabs. | XLII. A Real Live Mermaid. |
| XVII. Stone-Fish and Stone-Lilies. | XLIII. Great Whales Also. |
| XVIII. Long-Buried Reptiles. | XLIV. A Seal-Skin Cloak. |
| XIX. Birds of other Ages. | XLV. Flying Mammals. |
| XX. The Early Mammals. | XLVI. Order out of Confusion. |
| XXI. Very Old Families. | XLVII. Nibblers. |
| XXII. The Marvel in Mail. | XLVIII. Gnawers. |
| XXIII. The Wonderful Builder. | XLIX. The Thick Skins. |
| XXIV. An Opossum Hunt. | L. The Ruminants. |
| XXV. A New Fashion of Pappoose. | |
| XXVI. Low Down in the Scale. | |

Book IV. 370 pages. 28 illustrations.

60 cents.

RICKS' NATURAL HISTORY OBJECT LESSONS.

PART I.—PLANTS AND ANIMALS.

CHAPTER.	CHAPTER.
I. Introduction.	XVIII. Tea, Coffee and Chocolate.
II. A Typical Plant.	XIX. Spices.
III. General Classification of Plants.	XX. Opium, Quinine and Camphor.
IV. Minute Structure of Plants.	XXI. Indigo, Oak-Galls, etc.
V. Roots and their Functions.	XXII. Classification of Animals.
VI. Stems and their Uses.	XXIII. and XXIV. Classification of Vertebrata.
VII. Leaves and Buds.	XXV. Classification of Invertebrata.
VIII. Flowers, their Parts and Uses.	XXVI. Coverings of Vertebrate Animals.
IX. Fruits and Seeds.	XXVII. The Bony Skeleton and its Modifications.
X. The Palm Trees.	XXVIII. Teeth, — Varieties and Uses.
XI. Cereals, the Sugar-Cane, etc.	XXIX. Tongues.
XII. Starches.	XXX. Tails and their Uses.
XIII. Oils and Fats.	XXXI. The Principal Internal Organs of Animals.
XIV. Gums, Resins, Gum-Resins, etc.	
XV. Cotton, Hemp, Flax, Jute.	
XVI. Paper.	
XVII. Bleaching and Dyeing.	

PART II.—SPECIMEN LESSONS.

LESSON.	LESSON.
I. Paws and Claws.	XXXIV. The Mole.
II. Cocoa-Nut.	XXXV. Cotton.
III. Cotton and Wool.	XXXVI. Vertebrata and Invertebrata.
IV. An Egg.	XXXVII. The Cockroach.
V. Acorn and Hazel-Nut.	XXXVIII. The Earthworm.
VI. Milk.	XXXIX. Spider's Threads.
VII. Onion, Turnip, Carrot.	XL. Bleaching.
VIII. Cat and Dog.	XLI. The Rat and His Relatives.
IX. Down.	XLII. Beaks of Birds.
X. A Quill Feather.	XLIII. and XLIV. Snakes.
XI. Gutta Percha.	XLV. and XLVI. Fishes.
XII. Leaves.	XLVII. Insects — Form and Structure.
XIII., XIV. and XV. Starch.	XLVIII. Insects — Benefits and Injuries.
XVI. The Horse.	XLIX. Insects, — Metamorphosis.
XVII. The Cow and the Sheep.	L. Insects, Legs and Feet.
XVIII. Honey and Wax.	LI. Insect and Spider.
XIX. Ivory.	LII.—LIV. Legs and Feet, — Mammals.
XX. and XXI. Seeds and Seedlings.	LV.—LVI. Legs and Feet, — Birds.
XXII. Olive Oil.	LVII. Flour.
XXIII. Liber.	LVIII. The Frog.
XXIV. Mammals and Birds.	LIX. The Frog, — Life History.
XXV. Reptiles and Fishes.	LX. and LXI. Eggs.
XXVI. Mammals.	LXII. Snails.
XXVII. Chewing the Cud.	LXIII. Snails — Whelk and Periwinkle.
XXVIII. Horns and their Uses.	LXIV. Snails.
XXIX. Parts of a Flower.	LXV. The Amoeba and Foraminifera
XXX. Birds' Nests.	LXVI. The Hydra.
XXXI. The Hedgehog.	LXVII. Sea Anemones and Corals.
XXXII. Whale Oil.	LXVIII. Plant Factories.
XXXIII. Leather.	

352 pages. 121 illustrations and seven plates. Cloth, \$1.50.

READING.

Wright's Nature Readers: Sea-side and Way-side.

Boards. Illustrated. No. I., 95 pages. Price, 25 cents. No. II., 184 pages. Price, 35 cents. No. III., 300 pages. Price, 50 cents. No. IV., 370 pages. Price, 60 cents.

Designed for schools and families. Intended to awaken in children a taste for scientific study, to develop their powers of attention, and to encourage observation, by directing their minds to the living things that meet their eyes on the road-side, at the sea-shore, and about their homes.

The First Reader treats of crabs, wasps, spiders, bees, and some mollusks. The Second Reader treats of ants, flies, earth-worms, beetles, barnacles, star-fish, and dragon-flies. The Third Reader has lessons in plant life, grasshoppers, butterflies, and birds. The Fourth Reader treats of world life in its different aspects and periods.

Badlam's Suggestive Lessons in Language and

Reading. A Manual for Primary Teachers. Cloth, square. 283 pages. Price, \$1.50.

A thoroughly helpful book, the outgrowth of a real experience, and of such a suggestive character that its lessons cannot fail in their adaptability to the various grades.

The first part gives *Outline Lessons for Oral Work*, specimens of stories told by children, and simple fables for reproduction.

The second part is devoted to *Suggestive Lessons* for blackboard reading and word-building. The plan embraces the best known features of the various methods of teaching.

Badlam's Primer. In the series "Stepping Stones to Reading."

Illustrated. Boards. 131 pages. Price, 25 cents.

Its main features are its simplicity, variety, and gradual development of the lessons.

Badlam's First Reader. Illustrated. Boards. 170 pages. Price, 30 cts.

Follows and develops the general plan of the Primer.

Fuller's Illustrated Primer. Illustrated. Boards. 103 pages. 25 cts.

This book presents the "Word Method" in an attractive form for little children.

Fuller's Phonic Drill Charts.

Three Charts. Manilla paper. 30 x 42 inches. Price, unmounted, \$1.25; mounted, \$2.25.

These charts have been prepared for the purpose of exercising pupils in making the elementary sounds and in combining these to form syllables and words.

Smith's Reading and Speaking. Familiar Talks to Young Men

who would Speak well in Public. Cloth. 171 pages. Price, 60 cents.

A collection of suggestions to would-be speakers, consisting of informal talks on matters of importance to all young men.

Readers for Home and School.

A series of volumes to be edited by Professor CHARLES ELIOT NORTON, of Harvard University, and Miss KATE STEPHENS.

This series is to be of material from the standard imaginative literature of the English language. It will draw freely upon the treasury of favorite stories, poems, and songs with which every child should become familiar, and which have done most to stimulate the fancy and direct the sentiment of the best men and women of the English-speaking race.

[*In preparation.*]

D. C. HEATH & CO., Publishers, Boston, New York, Chicago, and London.

MUSIC AND DRAWING.

Whiting's Public School Music Course.

Boards. Books I. to V., 112 pages each. Price each, 25 cents. Book VI., 256 pages. Price, 54 cents. Part-Song and Chorus Book. Boards. 256 pages. Price, 96 cents.

This Course consists of a graded series of six elementary Music Readers (thus giving new music for each grade) and a High School Reader, with accompanying Charts. Every device that would make the books useful has been adopted. The exercises and songs are well adapted to the different grades and are all of a high order. It is believed that this series is by far the most complete and useful one ever published in this country.

Whiting's Public School Music Charts.

First Series, 30 charts, \$6.00; Second Series, 14 charts, \$3.00; charts separately (two charts on a leaf), 50 cents.

The First Series is designed for the lowest primary grades, which should be taught from the charts before they read from the First Music Reader. The Second Series is designed for the lowest Grammar Grades, and should precede the use of the Second Music Reader.

These Charts are well graded, progressive, educative, and interesting.

Whiting's Complete Music Reader.

Boards. 224 pages. Price, 75 cents.

Designed for Mixed, High, and Normal Schools, Academies, and Seminaries. A large variety of exercises and solfeggios are given for practice in connection with the Rudimentary Department, which is quite complete. Two-, three-, and four-part songs constitute a very important part of the book.

Supplementary Music for Public Schools.

Eight pages numbers, 3 cents; Twelve pages numbers, 4 cents; Sixteen pages numbers, 5 cents. Send for complete list. New numbers are constantly being added.

Whittlesey and Jamieson's Harmony in Praise.

A collection of Hymns for college and school chapel exercises, and for families. 75 cents.

Thompson's Educational and Industrial Drawing.

As at present proposed the entire system will consist of the following Series of Drawing Books and Manuals: (1) Manual Training Series; Two Manuals. (*Ready.* Price, 25 cents each.) (2) Primary Freehand Series; Four Books and Manual. (*Ready.* Price, \$1.00 dozen.) (3) Advanced Freehand; Four Books and Manual. (*Ready.* Price, \$1.50 dozen.) (4) Model and Object; Three Books and Manual. (*Ready.* Price, \$1.75 dozen.) (5) Historical Ornament; Three Books and Manual. (*In press.*) (6) Decorative Design; Three Books and Manual. (7) Geometrical; Two Books and Manual. (8) Orthographic Projection; Two Books and Manual. (9) Perspective; Three Books and Manual.

This System of Drawing is accompanied by an abundant supply of apparatus. The author has had many years' experience in teaching from the lowest Primary through the Grammar, High, and Technical Schools, and it is believed that the books are so well thought out both from a philosophical and from a practical point of view, as to be adapted to all approved methods and views in the study of drawing.

Send for full descriptive circulars and special introduction prices.

D. C. HEATH & CO., Publishers,

BOSTON, NEW YORK, CHICAGO, AND LONDON.

ELEMENTARY SCIENCE.

Natural History Object Lessons. A Manual for Teachers.

By GEO. RICKS, Inspector of Schools, London School Board. Cloth. 352 pages. Retail price, 1.50.

Guides for Science-Teaching.

Published under the auspices of the **Boston Society of Natural History**. For teachers who desire to practically instruct classes in Natural History, and designed to supply such information as they are not likely to get from any other source. 26 to 200 pages each. Paper.

- | | |
|--|---|
| I. HYATT'S ABOUT PEBBLES, 10 cts. | VIII. HYATT'S INSECTS, \$1.25 |
| II. GOODALE'S FEW COMMON PLANTS, 20 cts. | XII. CROSBY'S COMMON MINERALS AND ROCKS, 40 cts. Cloth, 60 cts. |
| III. HYATT'S SPONGES, 20 cents. | XIII. RICHARDS' FIRST LESSONS IN MINERALS, 10 cts. |
| IV. AGASSIZ'S FIRST LESSON IN NATURAL HISTORY, 25 cts. | XIV. BOWDITCH'S HINTS FOR TEACHERS ON PHYSIOLOGY, 20 cts. |
| V. HYATT'S CORAL AND ECHINODERMS, 30 cts. | XV. CLAPP'S OBSERVATIONS ON COMMON MINERALS, 30 cts. |
| VI. HYATT'S MOLLUSCA, 30 cts. | |
| VII. HYATT'S WORMS AND CRUSTACEA, 30 cts. | |

Note Book. To accompany Science Guide No. XV.

Paper. 48 pages, ruled and printed. Price, 15 cents.

Science Teaching in the Schools.

By WM. N. RICE, Prof. of Geology, Wesleyan Univ., Conn. Paper. 46 pp. Price, 86 cts.

Elementary Course in Practical Zoology.

By B. P. COLTON, A. M., Professor of Science, Illinois Normal University. Cloth. 196 pages. Price by mail, 85 cts.; Introduction price, 80 cts.

First Book of Geology.

By N. S. SHALER, Professor of Palæontology, Harvard University. 272 pages, with 130 figures in the text. Price by mail, 1.10; Introduction price, 1.00.

The Teaching of Geology.

By N. S. SHALER, author of First Book in Geology. Paper. 74 pages. Price, 25 cents.

Astronomical Lantern and How to Find the Stars.

By REV. JAMES FREEMAN CLARKE. Intended to familiarize students with the constellations, by comparing them with fac-similes on the lantern face. Price of the Lantern, in improved form, with seventeen slides and a copy of "How to FIND THE STARS," \$4.50. "How to FIND THE STARS," separately. Paper. 47 pages. Price 15 cts.

Studies in Nature and Language Lessons.

By PROF. T. BERRY SMITH, of Central College, Fayette, Mo. A combination of simple natural-history object lessons, with elementary work in language. Boards. 121 pages. Price, 50 cts. Parts I. and II. 48 pages. Price, 20 cts.

D C. HEATH & CO., Publishers,

BOSTON, NEW YORK AND CHICAGO.

Why should Teachers *Read the Literature of their Profession?*

1. Because *no man can stand high in any profession who is not familiar with its history and literature.*
2. Because *it saves time which might be wasted in trying experiments that have already been tried and found useless.*

Compayre's History of Pedagogy. "The best and most comprehensive history of Education in English." — Dr. G. S. HALL.	\$1.75
Compayre's Lectures on Teaching. "The best book in existence on the theory and practice of Education." — Supt. MACALLISTER, Philadelphia.	1.75
Gill's System of Education. "It treats ably of the Lancaster and Bell movement in Education — a very important phase." — Dr. W. T. HARRIS.	1.25
Radestock's Habit in Education. "It will prove a rare 'find' to teachers who are seeking to ground themselves in the philosophy of their art." — E. H. RUSSELL, Worcester Normal.	0.75
Rousseau's Emile. "Perhaps the most influential book ever written on the subject of Education." — R. H. QUICK.	0.90
Pestalozzi's Leonard and Gertrude. "If we except 'Emile' only, no more important educational book has appeared, for a century and a half, than 'Leonard and Gertrude.'" — <i>The Nation</i> .	0.90
Richter's Levana; or the Doctrine of Education. "A spirited and scholarly book." — Prof. W. H. PAYNE.	1.40
Rosmini's Method in Education. "The most important pedagogical work ever written." — THOMAS DAVIDSON.	1.50
Malleson's Early Training of Children. "The best book for mothers I ever read." — ELIZABETH P. PEABODY.	0.75
Hall's Bibliography of Pedagogical Literature. Covers every department of Education.	1.50
Peabody's Home, Kindergarten and Primary School Education. "The best book outside of the Bible I ever read." — A LEADING TEACHER.	1.00
Newsholme's School Hygiene. Already in use in the leading training colleges in England.	0.75
DeGarmo's Essentials of Method. "It has as much sound thought to the square inch as anything I know of in pedagogics." — Supt. BALLIST, Springfield, Mass.	0.65
Hall's Methods of Teaching History. "Its excellence and helpfulness ought to secure it many readers." — <i>The Nation</i> .	1.50
Seidel's Industrial Education. "It answers triumphantly all objections to the introduction of manual training to the public schools." — CHARLES H. HAM, Chicago.	0.90
Badian's Suggestive Lessons on Language and Reading. "The book is all that it claims to be and more. It abounds in material that will be of service to the progressive teacher." — Supt. DUTTON, New Haven.	1.50
Redway's Teachers' Manual of Geography. "Its hints to teachers are invaluable, while its chapters on 'Modern Facts and Ancient Fancies' will be a revelation to many." — ALEX. E. FRYE, Author of " <i>The Child in Nature</i> ".	0.65
Nichols' Topics in Geography. "Contains excellent hints and suggestions of incalculable aid to school teachers." — <i>Oakland (Cal.) Tribune</i> .	0.65

 **20% discount to Teachers.**

D. C. HEATH & CO., Publishers,

BOSTON, NEW YORK AND CHICAGO.

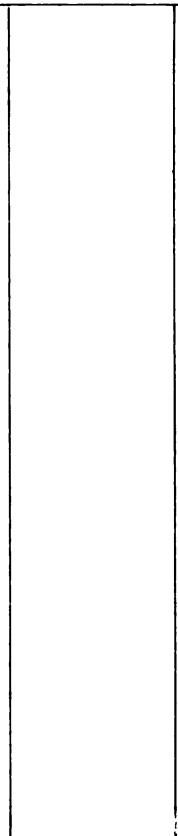




1

To avoid fine, this book should be returned on
or before the date last stamped below

10M-6.40



Tx
580.5
S741

Spear, Mary A.
Leaves and flowers.

621378

NAME	DATE	NAME	DATE

621378

BRA
LIBRARY. SCHOOL OF EDUCATION, STANFORD

5741

